Electrical World

A McGRAW-HILL PUBLICATION

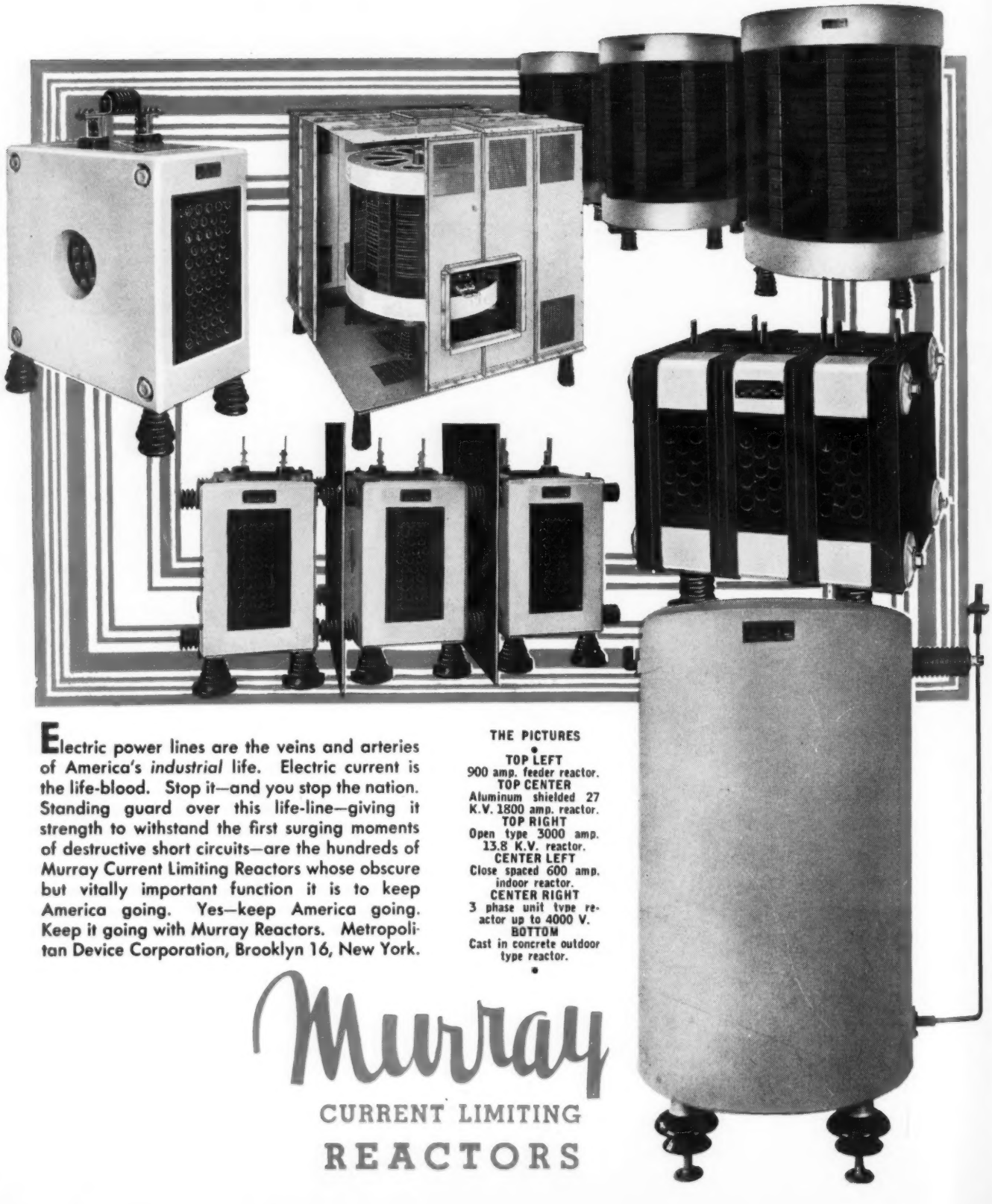
Functions Fix Design
Of New Service Building

DECEMBER 21, 1946

Features

A Versatile Watthour Meter Is Needed
Cyclone Burner Eases Slag and Dust Problem
Electric and Telephone Utilities Assist Each Other

GUARDING THE ARTERIES OF Electrical America!



Electric power lines are the veins and arteries of America's *industrial* life. Electric current is the life-blood. Stop it—and you stop the nation. Standing guard over this life-line—giving it strength to withstand the first surging moments of destructive short circuits—are the hundreds of Murray Current Limiting Reactors whose obscure but vitally important function it is to keep America going. Yes—keep America going. Keep it going with Murray Reactors. Metropolitan Device Corporation, Brooklyn 16, New York.

THE PICTURES

•

TOP LEFT
900 amp. feeder reactor.
TOP CENTER
Aluminum shielded 27 K.V. 1800 amp. reactor.
TOP RIGHT
Open type 3000 amp. 13.8 K.V. reactor.
CENTER LEFT
Close spaced 600 amp. indoor reactor.
CENTER RIGHT
3 phase unit type reactor up to 4000 V.
BOTTOM
Cast in concrete outdoor type reactor.

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Murray

CURRENT LIMITING REACTORS

Electrical World

FOUNDED IN 1874 • READ BY ELECTRICAL MEN FOR 72 YEARS

December 21, 1946

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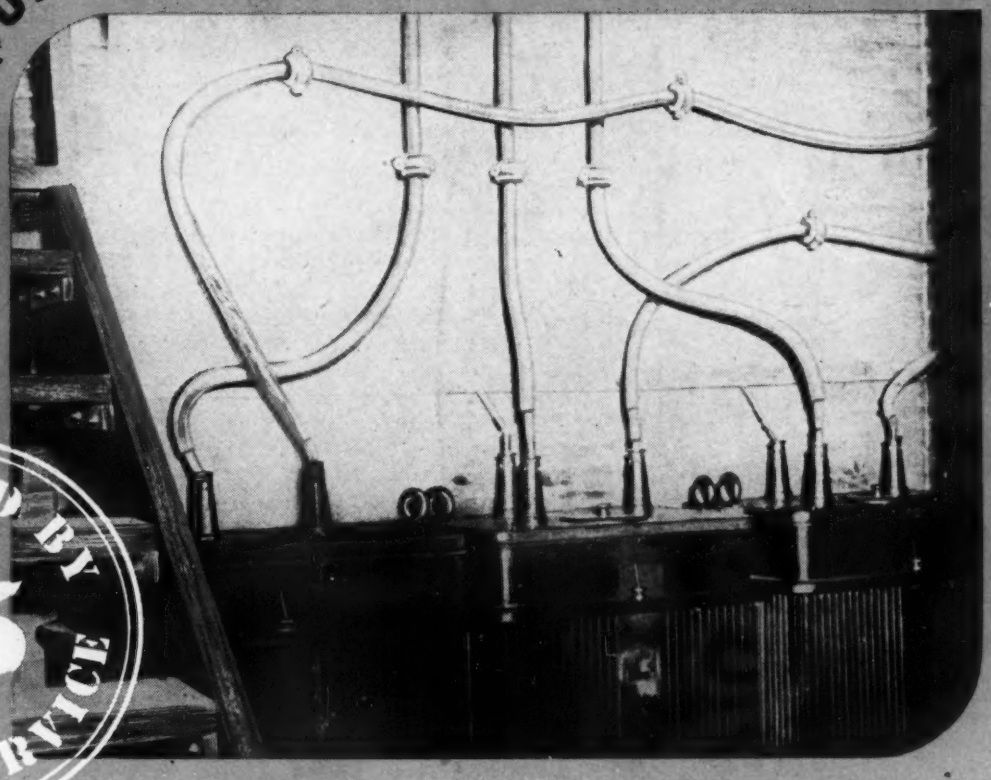
TIME puts its OK on KEYSTONE

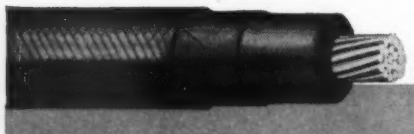


PROVED BY 25 YEARS SERVICE

Typical service record of Hazard Keystone Insulation is this 22,000 volt transformer cable installation — no trouble for 25 years . . . no signs of deterioration .

When you are plotting ways and means to keep ozone, moisture and heat from short-changing you in power circuits, remember this concrete example of what you can expect from Hazard Keystone Insulation under such operating conditions — 25 years of trouble-free service and still no signs of insulation deterioration is the history of these 22,000 volt transformer cables installed by an inter-urban electric railroad.

Hazard Keystone Insulation effectively combines in one oil-base compound unusual resistance to ozone, heat, moisture, sunlight, chemicals and acids. It has been used with outstanding success for aerial, underground, interior and submarine circuits with various types of outside protective jackets employed in accordance with the particular job requirements. For all the facts, write for bulletin H-403. The Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pa.



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insulated wires and cables for every electrical use

4889

Electrical World

DECEMBER 21, 1946

One and a Half Billion Dollars

CONSTRUCTION of power plants, lines and other facilities planned by electric utilities for 1947 will almost certainly mount up to a money total larger than ever before in the history of the industry. This is indicated by preliminary summations as returns are received in the survey of power system construction and expenditures regularly made by ELECTRICAL WORLD for its annual statistical number. Possibly the 1947 total will approach one and a half billion dollars.

If it is delivered, that's a nice Christmas present for electrical and other manufacturers, for the construction industry, for the labor employed by them, and for the millions of people who benefit from the power company construction dollar as it percolates through the nation's economy. The same Christmas present was promised last year, not such a big one as this time, but sizable; close to a billion dollars, it was. Because of strikes, shortages and survival of war-time controls, only about half of that contemplated expenditure was made. Let's hope that such hindrances will not again prevent the electric utilities from making all of the capital outlays they have planned.

Allowing for the fact that higher costs contribute materially to the rise of the 1947 budget over that contemplated for 1946 at this time last year, the construction program for 1947 is still considerably larger than was the one on which 1946 failed to deliver the goods. It is probable that additions to generating capacity in 1946 will not do much more than compensate for retirements, will result in only a comparatively small net increase. With weekly outputs of electricity climbing to record high levels in the second half of 1946 and aggregate peak loads exceeding the highest of the war years, their inability to obtain and install all the generating capacity planned for 1946 is a matter of very serious concern to the utilities.

Almost as serious a problem is posed in regard to distribution systems by the rapidly increasing residential use of electricity. Even though the anticipated post-war flood of domestic appliances has not materialized, the average kw.-hr. sold per residential customer made the biggest jump up in 1946 so far recorded. What will happen when appliances become easily available, when salesmen are out ringing doorbells again? This question has the utilities worried more than a little.

If strikes and other interferences with production again upset the economic applecart in 1947 as they did in 1946, the electric utilities will again be unable to carry out their construction plans. And that will be just too bad, not only for the utilities themselves, but for the users of their service. If this happens, it is quite possible we shall see a bitterly ironic spectacle—an industry whose service under the stress of war was "never too little or too late," forced in time of peace to its first failure to provide completely for the needs of the nation.

★ ★ NEWS OF THE

WAA and Utilities Officials Act to Speed Surplus Sales

Simplification of Procedures for Sale of Utility Properties and Equipment Promised When Spokesmen for Utilities Blame Unsatisfactory Sales on Red Tape and not on Lack of Interest

SOME SPEEDING of surplus property sales to public utilities may result from the conference of industry spokesmen and War Assets Administration officials held last week in Washington.

Major developments of the session, which was attended by representatives of some 30 electric and gas utilities from all sections of the United States, were these:

1. A pledge of closer cooperation between the utilities and WAA's 32 regional offices in locating and arranging for the disposal of surplus facilities sought by the industry.

2. A promise by WAA to simplify as far as possible within legal limitations its procedures for disposing of utility properties and equipment.

L. Gray Marshall, deputy director of WAA's industrial division, who presided at the conference, provoked a number of suggestions from the industry group when he expressed concern over "the apparent lack of interest on the part of the industry in acquiring surplus utilities properties, either for use in place or for removal and use elsewhere."

Blaming the lengthy administrative processes to which surplus property is subjected before being offered for disposal as the cause of any "lack of interest," Philip Sporn of the American Gas & Electric Service Corp., urged that the utilities be placed on an equal purchasing basis with other priority bidders until the present shortage of utilities equipment is eased. He pointed out that the utility companies would prefer new equipment to the government's war surplus and that once production of new materials returned to normal the demand for surplus would dwindle.

Robert H. Fite, Florida Power & Light Co., recommended that utilities now serving installations to be sold for use in place should be permitted to purchase the electric, gas and water facilities that must remain in service. Present WAA policy, Mr. Marshall said, is to issue revocable permits for the use of such facilities until the final disposition of the properties is determined.

At the suggestion of W. P. Reilly, Ebasco Services, Inc., and others, plans for cooperation between the utilities and WAA regional offices were approved.

•

Atomic Energy and Coal May Compete in Future

The economic possibilities of atomic energy electric power plants were indicated recently by A. C. Monteith, manager of Headquarters Engineering of the Westinghouse Electric Corp., in an address to engineers and other employees of the Commonwealth Edison Co., Chicago.

Assuming that it might be possible to cut costs of an atomic energy plant down to $180 per kw. (present figure is thought to be $300) and that if the cost of uranium were $50 per pound, the total costs of generation for 75 percent load factor would be about the same as those of a steam plant using $6 per ton coal, Mr. Monteith said.

If uranium cost nothing, energy could be generated in competition with $2 per ton coal. This brings uranium in the realm of competition with coal after the many technical problems are overcome.

He warned, however, that development of atomic power for industrial use is entirely dependent on the Atomic Energy Commission which will have complete control over the use of uranium for any purpose.

•

Sale of Nebraska Power to Omaha P.P.D. Effected

Omaha Public Power District recently took over the properties of the Nebraska Power Co. from the Omaha Electric Committee which has been operating them. The transaction was completed in New York City at the offices of the Guaranty Trust Co. The bank was a leader of a group of 101 banks which loaned the district $42,000,000 to finance the deal.

Nebraska Power will continue to exist as a corporation for an indefinite time until its affairs are settled; then it will go out of business.

Order Will Have No Effect on Surplus Sales

President Truman's order terminating construction priorities probably will have no effect upon the disposal of utilities equipment from government war surplus, National Housing Agency officials predicted this week.

No additional HH priorities will be issued for purchases of equipment for use in veterans' housing construction. However, the president's order provides for the honoring of all HH priority certificates already issued, and surplus disposal agencies reported that a great number of such certificate holders are yet to be supplied.

Though no official interpretation had been handed down as this was written, it was believed that the priority certificates provided by recent NHA directives would be continued. These certificates, which permit a utility to obtain a priority status in bidding for surplus materials needed for housing, probably will be broadened soon to allow utilities to bid for a wider variety of equipment than they have been allowed to in the past.

Cleveland Utility Quickly Switches from Coal to Oil

To assure adequate service to its customers, the Cleveland Electric Illuminating Co. on November 21, the first day of the soft coal strike, began to convert three of its generating plants and one of its central steam heating plants from coal to oil burners.

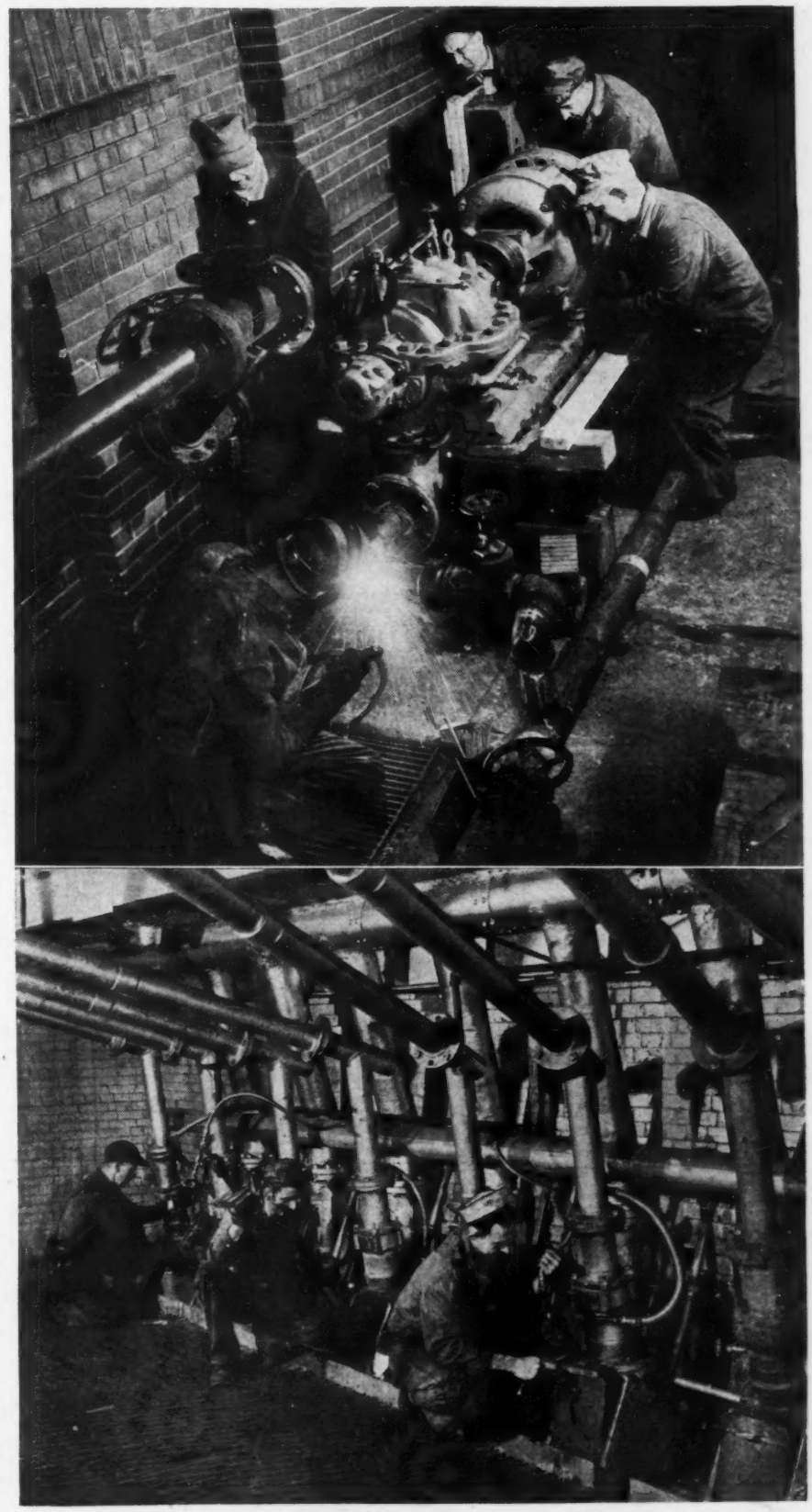
The company's goal was the installation of sufficient temporary facilities to burn 1,000,000 gal. of oil daily, equal to 6,000 tons of coal or three-fourths of the company's daily fuel consumption under operating conditions at the time of the emergency.

More than ten departments cooperated in the project, working day and night. Many of the oil burners and other components of the installation were made in the company's own machine shops. In gathering the necessary materials and equipment to convert to oil, company representatives and trucks travelled in five states.

If the coal strike had continued, the utility would have reached its goal of 1,000,000 gal. of oil daily by December 16. With the drop in load which would have followed the railroad embargo, the company would have had sufficient oil-burning capacity to have satisfied demands on its system for steam and electric service.

The first major installation was put into operation at the Lake Shore plant on November 30. This installation burned 114,000 gal. of oil daily, equal to the steam generating equivalent of 710 tons of coal.

During the first eight days of the strike, the utility used 1,561,000 gal. of oil. Tank cars were used as temporary reservoirs at plants.



QUICK CHANGEOVER—One of the utilities which quickly converted its coal-burning plants to permit the use of oil during the coal strike was the Cleveland Electric Illuminating Co. Top picture shows workmen installing an electric motor-driven oil pump at the Lake Shore plant. The motor forces oil from tank cars into the burners under the boilers. Bottom, installation of burners in the same plant. The small pipes feed oil, and the large ones are regular equipment used to feed pulverized coal into the boiler furnaces

BEHIND THE RESEARCH ADVISORY SERVICE—The Northwest Research Advisory Service Committee of the Northwest Electric Light and Power Association at its December 11 meeting in Spokane to review achievements and plan for the future of the service. Seated, left to right, are Berkeley Snow, executive secretary of the association; Ladner Ross, director, Research Advisory Service; W. L. Thrailkill, Washington Water Power Co., committee chairman; and James H. Polhemus, Portland General Electric Co., president of the association. Those standing are members of the committee

Northwest Research Body Proves Worth to Utilities

Approximately 500 requests for technical advice on processing, packaging, and management have been made to Northwest Research Advisory Service by utility companies providing this service to their customers in the first eight months of operation, according to Ladner V. Ross, director of the service. This report came out at a meeting of Research Advisory Service committee of the Northwest Electric Light and Power Association in Spokane, December 11. The association is administering the service for eight of its member companies.

Company coordinators who act as liaison between the companies and the director's office reviewed the operation, examined a cost analysis, and laid plans for expanded operation during 1947.

The service was originally purchased from Lt. Col. Bert H. White, Buffalo, N. Y., and is rendered by the utility companies in Oregon, Washington, Idaho, Montana, and British Columbia. Briefly, it offers to the industrial customers of these companies non-confidential answers to technical problems gathered from the best source among some 900 research laboratories and trade press files in the United States and Canada, who have offered their cooperation in the solution of these problems.

W. L. Thrailkill, Washington Water Power Co., vice-president of the association and chairman of the Research Advisory Service committee, reported to the Association Executive Committee meeting in Spokane, December 12, that customer reaction to this new service offered by the member companies of the association had been generally quite favorable.

•

Soda Ash Production Low; No Relief Likely until 1948

A shortage of 500,000 tons of soda ash this year and a similar shortage in 1947 were indicated this week after a study of the industry by government officials.

To increase production, the Civilian Production Administration has authorized the Solvay Process Co. to build two plants and the Wyandotte Chemical Co. to build one. Total output of these plants will be approximately 360,000 tons annually, but the soonest that these plants can go into operation is late in 1947.

In a move to reduce exports, the Office of International Trade (Department of Commerce) has put soda ash on the export license list.

The current shortage is due to increased consumption in the glass, chemical, and paper industries. Foreign demands are increasing because of the effects of the war and strikes on production in England and Germany and the complete collapse of the industry in Japan.

Foremen's Union Case Will Be Appealed to High Court

The Supreme Court will be asked to rule upon the propriety of a government contract with organized foremen in four captive mines of the Jones & Laughlin Steel Corp.

Following a decision this week by the U. S. Court of Appeals for the District of Columbia, which upheld the authority of the Coal Mines Administration to enter into the contract, attorneys for the steel company announced their intention of carrying an appeal to the high court. The Appellate Court made it clear that it had approved only the government's right to sign a contract during the period of federal seizure of the mines with District 50, United Mine Workers of America, which had been certified by the National Labor Relations Board as bargaining agent for the J. & L. supervisory employees.

A legal test of the validity of NLRB's certification of the foremen's union is expected to follow a pending decision of the board on unfair labor practice charges brought against the company by U.M.W. The union has complained that J. & L. has refused to enter into collective bargaining negotiations with U.M.W.

Another important test case on the legal status of foremen's unions, Packard Motor Car Co. vs. NLRB, already has been scheduled for review by the Supreme Court.

Personnel Policy Should Aim at Greatest Effective Output

A. E. Grauer, British Columbia Electric Railway Co., Gives Outline of Personnel Department Functions at Meeting of Northwest Association Section—Convention Plans Discussed

THE FUNDAMENTAL PURPOSE of a personnel policy is to secure maximum effective production from the manpower at hand, and there are five major heads under which personnel department activities can be organized to cover most of the fields included in the broad phrase, "maximum effective production." This statement by A. E. Grauer, president, British Columbia Electric Railway Co., keynoted the annual fall conference of the Personnel Section, Northwest Electric Light and Power Association, at Vancouver, B. C., December 5-7.

5 Functions of Personnel Department

Mr. Grauer named these five major functions of a personnel department: selecting personnel, handling personnel, providing services for personnel, recording personnel activities, and personnel research. He elaborated the responsibilities of each, bringing out that sound job analysis preceded selection and that a carefully thought out system of rating individual merit should be the basis of the salary and wage policy.

Trends in utility company organization were discussed by T. M. Moran, vice-president of the same company, emphasizing the application of committee functioning in his company. Each department and division has an employee-management committee, he said, which feeds recommendations up to the company operating committee consisting of top management and the heads of departments. Decisions that cannot be made by this committee are passed on up to the board of directors. A high degree of coordination in the company operations is attained under this system.

Scientific selection procedures have recently been adopted by the Canadian company, using the services of J. W. A. Fleury, psychologist, for screening all new applications for jobs and applicants for promotion. Under this system, said Mr. Fleury, an applicant's interests, abilities, and personality are scientifically explored and are measured against a "desirable pattern" previously worked out for each job description.

Five section committees reported progress and discussed plans and programs looking toward the next meeting of the section to be held in the spring of 1947.

Results of job evaluation studies recently undertaken by several member companies were reported under the committee on this subject, headed by J. E. Allan, B. C. Electric. The maintenance of a job evaluation program was shown to be of major importance. Interest was also manifest in aptitude testing and merit rating as major by-products of job evaluation.

Employees' service and benefits among the several companies had been surveyed by R. H. Sessions, Idaho Power Co., chairman, and were discussed in his absence by W. L. Thrailkill, Washington Water Power Co. It was the consensus that new or changing practices with respect to pensions, medical aid, sick leave, recreation facilities, and other benefits be brought up-to-date for the spring meeting, with the committee recommending sound practices in this regard.

Several companies are planning to go more extensively into employee training in 1947, according to a report of the Employee Training Committee by C. W. Sherman, Puget Sound Power & Light Co., chairman.

Louis Matter and Frank Baker of that company reported on the first lineman's training course conducted by Puget Sound Power & Light Co., ending in August, in which twelve apprentice linemen passed from the lower grades of apprenticeship to sixth period apprenticeship through a concentrated course in 13 weeks. Foremen and other linemen of the company were instructors. The course is being conducted for another class of 22 men at the present time.

Safety inspection and compliance with safety code regulations were the principal subjects discussed by the Accident Prevention Committee under Don Prairie, Northwestern Electric Co., chairman. The committee plans to hold a special meeting for safety supervisors and accident prevention men at the next section meeting.

An analysis of personnel forms used by several companies, prepared by Fred Groch, Portland General Electric Co., was found to be valuable to member companies in analyzing their own forms from the standpoint of keeping these reduced to the minimum needed for keeping adequate personnel records.

FOR GAINING PUBLIC GOOD WILL—D. W. Jardine, left, president of Pennsylvania Electric Co., presents to R. A. Pickup, manager of the Oil City District, the first trophy awarded to one in a group of seven districts under the utility's "Four-Point Plan" which provides for semi-annual appraisal of districts on personal factors, customer satisfaction, appearance of property and favorable atmosphere. The trophy will remain in competition

Argentina-Chile Agreement Threat to Copper Firms

The American copper industry with an enormous backlog in orders brought about by increased demands of the electrical industry and strikes in all its branches found no consolation last week in an announcement that Argentina and Chile had signed a five-year pact providing for a "customs union."

The pact specifically excludes other nations, even those having most-favored-nation treaties, from the special privileges granted, and "the parties are obliged to attend preferentially to the needs of the other with regard to exportable products."

President Juan D. Peron of Argentina needs both coal and metals for his five-year plan, with its provisions for the mobilization and development of industry for all-out military defense. That he will get them from Chile is apparent, as Chile is to give special attention to increasing the production of "copper, iron, nitrates, coal, wood, and hydraulic energy."

That the pact is likely to decrease exports of needed metals to this country was accepted by foreign trade experts. Officials of the State Department at Washington expressed dissatisfaction but withheld comment until Secretary James Byrnes could confer with the American ambassadors to the countries involved.

•

Sho-Me Co-op Petitioning to Reorganize as Utility

Sho-Me Power Cooperative, Marshfield, Mo., has asked permission of the Missouri Public Service Commission to reorganize as a public utility. Last January, the co-op, which had 31 REA co-ops as stockholders, was given a year to reorganize by the Missouri Supreme Court which held that it had exceeded the powers granted to it under its charter (ELECTRICAL WORLD, January 26, page 6).

The co-op seeks to change its name to Sho-Me Power Association, Inc., to take over a debt of $2,449,441 to the Rural Electrification Administration, and to issue 12,000 shares of stock, 11,950 of $5 par value and 50 shares of $20 par value.

•

Mississippi Plant Planned

Misssissippi Power & Light Co. will erect a 30,000-kw. steam generating plant about five miles north of Jackson. Natural gas will be used for fuel. The cost is placed at $4,500,000.

Employees Get Entire Gain in Revenues

Gross revenues in 1946 of the business-managed electric power companies will rise by almost $100,000,000 to a new high of $3,100,000,000, according to an estimate made by W. M. Carpenter, economist of the Edison Electric Institute. All of this gain, however, will have been absorbed by increased wages with payrolls now constituting the largest item of utility expense.

Most of the estimated saving of $60,000,000 resulting from the ending of the excess profits tax is being offset by increased costs in fuel and general expenses, so that the year 1946 will finally show a gain in operating income of only $15,000,000 out of the additional $100,000,000 in gross revenues received by the companies.

Because of refunding operations, the utilities paid in 1946 almost $80,000,000 less to their bondholders than they did in 1945, and 1946 will probably show an increase of $95,000,000 in the net income available for dividends, additions to working capital and surplus funds to a grand total of $630,000,000. While this represents the highest figure so far recorded, it is only 5 percent more than in 1930 when invested capital was at least 25 percent smaller.

Pacific Gas & Electric Co. Has $160,000,000 Program

The Pacific Gas & Electric Co. has underway or planned construction and improvements which will cost $160,000,000. The company plans to spend $40,000,000 this year, and $60,000,000 annually in 1947 and 1948.

P. G. & E. President James B. Black reported that the program will add 625,748 hp. to the company's system and will bring total capacity to 3,109,636 hp. by the end of 1948.

Most recent addition to the firm's post-war projects are three new hydroelectric projects on the North Fork of the Mokelumne River.

The Electra powerhouse, largest of the three, will have an installed capacity of 132,708 hp. and will cost $15,930,000. It will replace one of the oldest plants in the system, a 26,810-hp. plant in operation since 1902. The West Point powerhouse, to cost $4,000,000, will have a capacity of 20,107 hp. The third plant, a 44,236-hp., Bear River powerhouse, will not be built until after 1948, and its cost is not included in the $160,000,000.

Other major projects are:

Pit No. 1 Powerhouse (Pit River)—Improvement of regulating facilities to increase the peak load capacity by more than 42,000 hp., $940,000.

Potter Valley Powerhouse (Russian River)—Increase the plant's peaking capacity by 5,630 hp. at a cost of $75,000.

Station P Steam Plant (Hunters Point, San Francisco)—Two 134,000-hp. generators and associated equipment added to increase plant capacity to 330,000 hp., $24,582,000.

Kern Steam Plant (Bakersfield)—Construction of 100,500-hp. steam-operated generating plant, $12,890,000.

Eureka Steam Plant — Additional facilities at Station B, Eureka, to add 12,567 hp., $478,000.

Salt Springs Powerhouse (Mokelumne River)—Expansion of storage capacity of Salt Springs reservoir by about 9,500 acre-ft., $330,000.

•

Electric Energy Production Up 10.6% in September

Production of electric energy for public use during September, 1946, totaled 18,814,355,000 kw.-hr., according to the report issued by the Federal Power Commission. This is an increase of 10.6 percent over September, 1945, and marks the highest September public use production of record. Combined utilities and industrial production was 22,820,382,000 kw.-hr. during September, an increase of 10.1 percent above September of last year.

Average daily production of electric energy for public use in September was 686,655,000 kw.-hr., an increase of 2.0 percent in comparison with the average daily production during the previous month, and increase of 10.2 percent over September, 1945.

Production by water power in September amounted to 5,642,495,000 kw.-hr., or 30 percent of the total output for public use.

•

Utility Will Aid City Plant

Logan, Utah, has signed a contract with Utah Power & Light Co. to supply emergency power to the city's municipal plant.

Iowa Utility Will Manage New Plant for REA Co-op

8 Cooperatives Form Power Firm and Sign Iowa Light & Power Co. to Manage Station for 35 Years

Eight Iowa REA cooperatives have organized the Central Iowa Power Co-operative which will erect a 22,000-kw. power plant, and the Iowa Electric Light & Power Co. has signed a contract with the new co-op to operate and manage the plant for 35 years. This is the first time such an agreement has been made between a private utility and a cooperative.

The power co-op was formed when private companies indicated that they could not supply enough power for the expanding cooperatives.

Under the contract the power co-op after five years can revoke its contract with Iowa Electric if operating efficiency is not satisfactory. This privilege may also be exercised at yearly intervals thereafter for the same reason. Iowa Electric cannot cancel the contract; and if the co-ops do, it must allow them to use its lines to deliver power to co-op substations.

Central Iowa will secure a loan from the Rural Electrification Administration, $5,000,000 or more it is believed, and will build the new plant near Cedar Rapids. Completion of the first unit is expected late in 1949. Later, it is planned to secure additional funds and add a second 22,000-kw. unit. The territory to be served stretches almost the breadth of the state.

The co-ops involved are Maquoketa Valley Rural Electric Cooperative, Anamosa; Tama-Iowa-Poweshiek Rural Electric Cooperative, Brooklyn; Guthrie County Rural Electric Cooperative Association, Guthrie Center; Buchanan County Rural Electric Cooperative, Independence; Greene County Rural Electric Cooperative, Jefferson; Linn County Rural Electric Cooperative Association, Marion; Marshall County Rural Electric Cooperative, Marshalltown; and Benton County Electric Co-operative Association, Vinton.

First president of the new power co-op is John B. Cousin, Dubuque, president of the Maquoketa co-op. Ora M. Hall, president of the Greene County co-op, is vice-president; and Oren C. Thompson, director of the Benton County co-op, secretary-treasurer.

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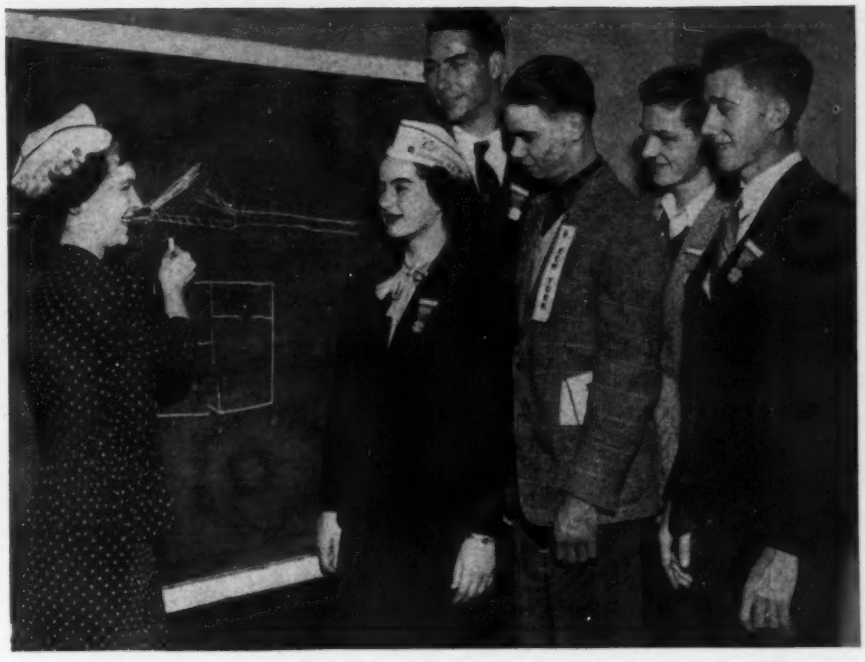
Gets 20-Year Franchise

Iowa Electric Co. recently won a 20-year franchise election in Marengo by a vote of 503 to 165.



WESTINGHOUSE SCHOLARSHIP WINNERS—Six national winners of Westinghouse Electric Corp. scholarships for their achievements in finding and adapting electrical methods to farm work study a drawing of a method of splicing wire before a dinner held in their honor in Chicago on December 3. All are 4-H Club members who were winners in competition in their home states

Half Tanker Will Supply Power for Eureka, Calif.

Pacific Gas & Electric Co. has announced that it will use salvaged wreckage of a tanker that split in two off the Aleutians to supplement the electrical energy of Eureka, Calif.

P. G. & E. was low bidder for the stern portion of the tanker, *Donbass III*, offering $125,000 for the 4,000-kw. boilers and generators. The company plans to tow the section from Seattle to Eureka, where it will be moored in a waterfront slip. A short transmission line will carry energy to consumers in the area.

The tanker's facilities will be used in an attempt to give immediate relief to power demands in the area, urgent for the past several months because of a growing lumber industry. Construction activities on an increased capacity for the steam plant there and the building of a new transmission line have recently been started, but completion dates are indefinite.

The transmission line, a 110-kv. circuit to cost $2,237,500, will stretch from Anderson to Freshwater, Calif., a distance of 110 miles. A switching station will be built at Freshwater. The territory is at present served by a 60-kv. line.

At the steam plant, capacity will be increased 40 percent from 12,500 to 17,500 kw. at a cost of $500,000 by the installation of a high-pressure turbine and generator topping unit and the rebuilding of boilers to higher pressure capacities.

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Morgan, Utah, Signs to Buy Power from Private Utility

Morgan, Utah, has signed a 10-year contract with Utah Power & Light Co. for electricity to be distributed through the city-owned system. The contract was signed a year after diesel and hydroelectric generators at the municipal plant were destroyed by fire. Power has been supplied for the past year by the utility.

Under the old municipal system, power cost consumers about 18 percent more than it will under the present system, but the upkeep of the distribution system will require considerable expenditure.

"It is not the plan of the present city administration," Mayor F. L. Parkinson said, "to rebuild the production plant. A petition has been circulated regarding sale of the distribution system and purchasing of power direct from U. P. & L. If this is the will of the people, a vote will be arranged."

Insurance company representatives last November made a full settlement of $37,183 insurance on the power plant which was destroyed by fire October 6, 1945.

Railroad Commission Gets New Name in California

Voters in California, while approving a proposition changing the name of the Railroad Commission to the Public Utilities Commission, also made appointments by the governor subject to veto by the state legislature.

By some, this was seen as an attempt to stop Gov. Earl Warren from further stacking the powerful five-man commission, three of the present membership being Warren appointees.

Under the new constitutional amendment which was approved by a three-to-one margin, gubernatorial candidates must win a majority vote of the state senate. With this body meeting only once in two years, however, considerable latitude is possible on interim appointments, depending, of course, on just when a vacancy on the commission occurs and whether there might be a special session.

Sponsors of the bill claim it will do away with "deathbed" appointments. These have been made in the past when the outgoing governor was called upon to replace two outgoing commissioners. This situation is made possible by the staggered six-year terms in the commission set-up. Thus, in the future, the governor on leaving office may make interim appointments, but these will come under review by the incoming state senate.

Changing the name of the commission was a logical step as its duties involve fixing rates and regulating all types of privately owned utility corporations, not the railroads alone.

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4 Electrocuted, 5 Injured

Four Pacific Gas & Electric Co. employees were electrocuted and five injured November 23 when a crane they were unloading at the company's Shasta substation near Cottonwood, Calif., came into contact with a 220,000-volt power line. Coroner Claude E. Whiteman reported the accident happened when the operator of the rented crane, not a P. G. & E. employee, swung the boom around to escape some trees, so hitting the power line.

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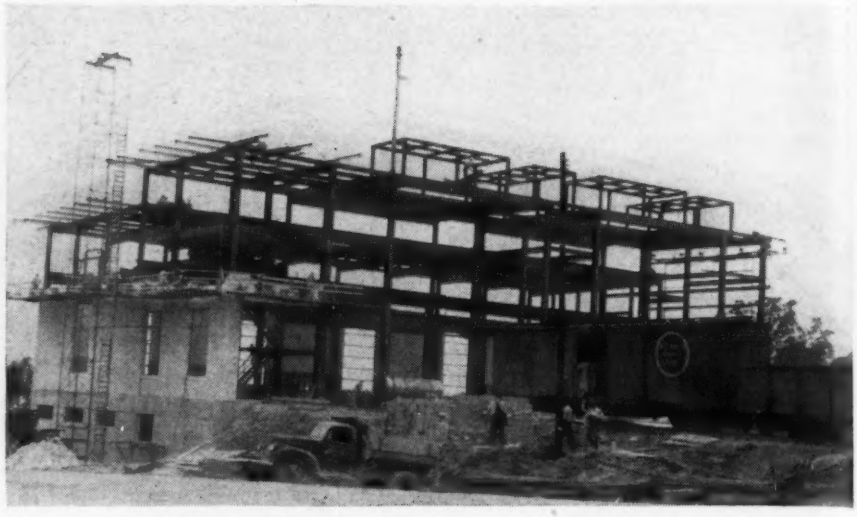
To Inform New Employees

Detroit Edison Co. has prepared a 34-page booklet, "Your New Job," for distribution to all new employees. Contents include pay, unions, working regulations, and other information of value to employees.



TO BE COMPLETED BY APRIL, 1947—Brick work on the exterior of the Lieberman plant of the Southwestern Gas & Electric Co. has begun, and it is hoped to have the 20,000-kw. plant in operation by next April. Other units can be added

Duquesne Union Presents Demands to Arbitrators

Arbitration proceedings in the dispute between the Duquesne Light Co. and the independent union led by George L. Mueller continued this week with the union presenting evidence to support its many demands. As soon as the union has presented its case, company officials will give their side.

Among the first demands made by union officers were a master contract to cover all employees of Duquesne Light and its affiliated companies, a wage increase of 20 percent, an increase in the number of holidays from seven to 13, a union shop, and foremen to be included in the union.

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Peak Loads Hit New High

The aggregate of major electric utility system peak loads for September, 1946, indicated a new record maximum of 39,352,000 kw., according to figures released by the Federal Power Commission. September peak loads, totaling 8.9 percent higher than September of last year, exceeded by almost 1,000,000 kw. the previous maximum of 38,379,604 kw. set in August, 1946. Corresponding energy requirements for September amounted to 18,530,517,000 kw.-hr., a gain of 9.8 percent over September of last year.

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Carolina Power & Light Co. Signs with Santee-Cooper

South Carolina Public Service Authority (Santee-Cooper) has signed a three-year contract with the Carolina Power & Light Co. for the sale of approximately 96,000,000 kw.-hr. of electricity annually. The cost to the utility will be around $500,000 annually. The power will be resold to six cooperatives in the Pee Dee section of the state for 7½ mills a kw.-hr.

The contract is similar to the one signed recently by the authority and the South Carolina Power Co.

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35,000-Kw. Unit Planned

Public Service Co. of Colorado will add a 35,000-kw. unit to its Lascombe steam plant at Denver. The cost will be $4,000,000, and the unit is to be in operation in 1948.

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Discontinues Appliance Sales

British Columbia Electric Railway Co. has discontinued the sale of all electric appliances. The dealer development department will be retained and expanded to aid appliance dealers.

MEETINGS

Electrical Engineering Exposition—71st Regiment Armory, New York, January 27-31. E. K. Stevens, manager, 480 Lexington Ave., New York 17, N. Y.

Previously Listed

Canadian Electrical Association—Winter conference, Chateau Frontenac, Quebec, January 13-15.

Agricultural Development Clinic—Fairmont Hotel, Fairmont, W. Va., January 24-25.

American Institute of Electrical Engineers—Winter meeting, New York, January 27-31.

SEC RULINGS

The Securities and Exchange Commission recently issued a series of orders affecting electric utility companies.

UNITED LIGHT & RAILWAYS CO. and its subsidiary, Continental Gas & Electric Corp., have been authorized to modify a loan agreement whereby Continental would issue and sell to banks $11,200,000 of promissory notes. Continental stated that the request was made so that it could fulfill a previous commitment made to the Kansas City Power & Light Co. to purchase additional common stock from Kansas City for $3,500,000 cash. (Release No. 7027).

PHILADELPHIA CO. was cited recently under provisions of the "death sentence" clause of the Holding Company Act by the commission, which instituted proceedings against the company, certain of its subsidiary companies and its parent companies—the Standard Power & Light Corp. and Standard Gas & Electric Co. The commission set hearing for January 21 to determine the extent to which the corporate structure of such holding company systems and the companies therein may be simplified, unnecessary complexities eliminated, voting power fairly and equitably distributed among security holders and the property and business of each such system confined within the standards of the Holding Company Act. (Release No. 7025).

BUFFALO NIAGARA ELECTRIC CORP. has been authorized to merge into itself two wholly owned subsidiaries—Hydraulic Race Co. and Lower Niagara River Power & Water Supply Co. The merger, which has been approved by the New York Public Service Commission, will simplify, according to SEC, the Niagara Hudson Power Corp.'s holding company system by eliminating two corporate entities. It also will simplify the United Corp.'s holding company system "by removing an extreme situation of pyramiding presently existing in violation of the 'great-grandfather' clause of Section 11 (b) (2)." (Release No. 7022).

OHIO POWER CO. and WEST PENN POWER CO. have been granted permission to make capital contributions of $263,500 each to the mutually owned subsidiary, Windsor Power House Coal Co. The entire output of the subsidiary is consumed by a generating station also jointly owned by Ohio Power and West Penn. (Release No. 7030).

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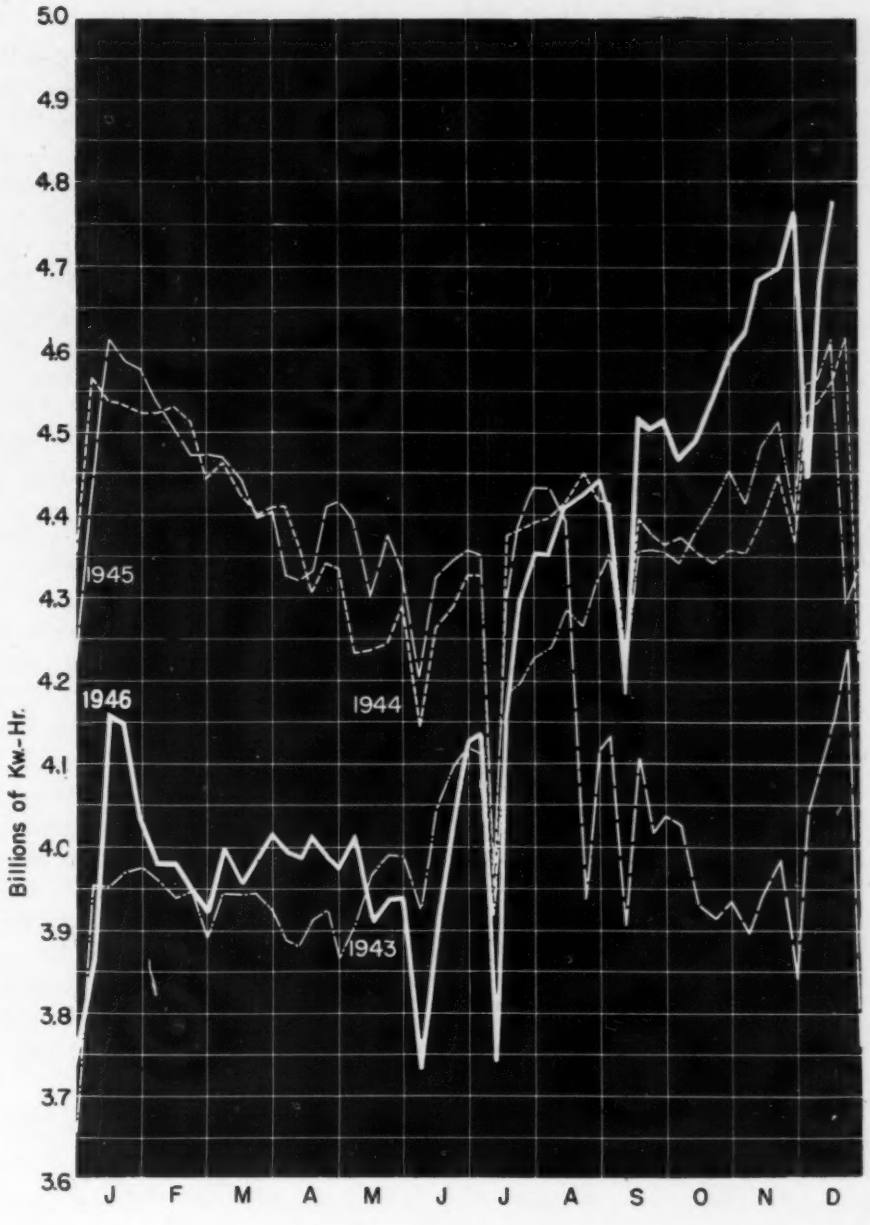
Toledo Utility Buys System

The Toledo Edison Co. has received approval of the Ohio Public Utilities Commission of its purchase of the Whitehouse (Ohio) Electric Co. for $75,000. The Whitehouse utility was owned by R. S. Graves, Syria, Va., and serves 560 customers in the town and suburbs with power purchased from Toledo Edison.



Electric Output Curve Hits New High

Swinging upward during the week ended December 14, 1946, the electric output curve reached a record high, according to figures released by the Edison Electric Institute.

The amount of electrical energy distributed by the light and power industry during the week amounted to 4,777,943,000 kw.-hr., the previous high being 4,764,718,000 kw.-hr. for the week ended November 23, 1946.

During the week ended December 15, 1945, the amount of electrical energy distributed totaled 4,154,061,000 kw.-hr., this year's figure representing an increase of 15.0 percent.

All of the major geographical regions of the country reported increases as compared with the corresponding week of 1945, the largest individual gain being shown by the Pacific Coast group with an increase of 26.1 percent.

Weekly Output, Millions Kw.-Hr.

1946		1945		1944	
Dec. 14	4,778	Dec. 15	4,154	Dec. 16	4,563
Dec. 7	4,673	Dec. 8	4,097	Dec. 9	4,538
Nov. 30	4,448	Dec. 1	4,043	Dec. 2	4,524
Nov. 23	4,765	Nov. 24	3,841	Nov. 25	4,369
Nov. 16	4,700	Nov. 17	3,985	Nov. 18	4,450
Nov. 9	4,682	Nov. 10	3,948	Nov. 11	4,397
Nov. 2	4,628	Nov. 3	3,899	Nov. 4	4,355
Oct. 26	4,602	Oct. 27	3,937	Oct. 28	4,358
Oct. 19	4,540	Oct. 20	3,915	Oct. 21	4,345
Oct. 12	4,495	Oct. 13	3,934	Oct. 14	4,355
Oct. 5	4,478	Oct. 6	4,028	Oct. 7	4,375
Sept. 28	4,518	Sept. 29	4,039	Sept. 30	4,366

Percent Change from Previous Year

	Dec. 14	Dec. 7	Nov. 30
New England	+11.3	+10.1	+ 0.1
Mid-Atlantic	+ 6.4	+ 3.9	— 0.1
Central Industrial	+13.5	+11.3	+ 6.8
West Central	+11.0	+ 9.3	+ 6.7
Southern States	+21.2	+22.1	+20.9
Rocky Mountain	+ 9.5	+ 9.7	+ 8.3
Pacific Coast	+26.1	+27.8	+21.7
Total United States	+15.0	+14.1	+10.0

Electrical World OPINION

More Intensive Residential Selling Will Soon Be Needed

DEMAND for appliances is—temporarily—far beyond the supply. This condition can be very short-lived, and soon also distribution equipment should be available to take care of load growth. Meanwhile, sales programs must wait, but their organization and implementation should not be delayed much longer.

Utility sales are not subject to the pressure and urge that is ever present in all other lines of business, where continued existence depends on the day by day selling job that is being done. Electrical energy sales remain reasonably constant even though the sales performance may be below par. In fact, some growth will undoubtedly continue without sales effort.

During most of the industry's history the demand for service has been so great that it has been necessary to devote major attention to the providing of adequate facilities. Although that problem apparently will persist for some time to come, there are now some definite indications of a different trend. The next cycle may well be one of keener competition, with the accompanying need for greater sales effort. Another factor is the development of new and more efficient appliances that require considerably less energy to operate. More light intensity, larger refrigerators and more appliances must be sold to maintain the revenue.

Some utility companies are not planning a renewal of their pre-war merchandising of appliances, feeling that electrical dealers and other outlets can handle this phase of load building. When accompanied by other plans for promotion, this change in policy may be advisable. For the long-range view, the over-all effort should be to intensify rather than slacken previous selling. Several plans with this objective are being arranged.

The management of one midwestern company is furnishing a good example in an area coverage plan built on the basis of known facts. Sales territories are to be established along the lines of meter reading routes so that kw.-hr. sales can be followed by and for each salesman. Market surveys of present appliances and lighting will be followed by selling, with each area salesman becoming acquainted with about 2,000 customers in his territory.

Such coverage, with two or three calls each year, is selling on a realistic scale. It is highly commendable for an approaching competitive market.

Preston S. Arkwright

BACK in the earliest years of the century a young lawyer in Atlanta was fortunate in having pretty close professional connection with a group of men who decided to start an electric light and street railway company. Needing someone to sign the stocks and bonds and other legal instruments of the new company, they offered the young lawyer the job of president. That's how, as he told it, Preston Arkwright became head of Georgia Power Co.

If it was fortunate for him that he happened to be handy at the time an official signature for the new venture was required, it was many times more fortunate for the infant industry of which he thus became a part. For Preston Arkwright brought into the electric utility business perceptions of values of human relations and capacities for dealing with the public that it then entirely lacked and that, despite his continued effort, still are too small a part of it. If the industry had had a few hundred more like him, it would probably be a lot better off today. He didn't know much about volts and amperes, and such things as transient stability were just words to him, but he did know how to get along with folks.

The monument to Preston Arkwright's memory is a multiple one of things and thoughts and feelings. Of things; go almost anywhere in Georgia and look at power plants, transmission lines and distribution systems. Of thoughts; see how the electric utility industry is belatedly acting on the truths of public relations he preached so long. Of feelings; talk to the thousands of company people and all the others who knew him and thus do mourn his going. This monument is his own work, built up of his acts and words, and it will endure for long.

Tell The People About Shortages

IN THE DARK SHADOWS of a poorly lighted residential street of a large middle western city a woman was assaulted recently. One reads about such things in the newspapers, but they always happen somewhere else, not right in front of one's own house. Thus were the comfortable people living along the street shocked and outraged when crime came up to their doors. They were especially indignant because they had been told the lighting of their street would be improved. But time had passed and nothing had been done. Now this had happened. Is it any wonder that bitter words were said about the power company under contract to light the streets of that city?

Everyone in the electric utility industry knows why the promised improvement in lighting that street had not been made. It is the same reason that is keeping a lot of new customers from getting service, that is slowing up the extension of farm lines, that is preventing the delivery of ranges, refrigerators, all kinds of appliances ordered months ago. The reason is shortages—shortages of transformers, of poles, of fittings, of hardware, of

meters, of practically everything that is needed to maintain, improve and extend an electric distribution system.

The people living along that tree-lined street, so pleasantly shaded during the day, so filled with pits of blackness in the night, knew about shortages, too. They were waiting for automobiles and white shirts just like the rest of the nation. They were waiting for the shelves of stores to be filled so they could buy what they wanted instead of being forced to take what they could get. But in the shock of seeing crime on the doorsteps, it did not occur to their minds that the same cause was keeping both white shirts and better street lighting from them.

The period of shortages is not ended. In respect of certain important lines of electrical goods, shortages may be worse before they are better. It will be quite a while before adequate production and rational distribution of raw materials and of finished goods are achieved. In the meantime, so they will not be blamed for what is not their fault, it will be wise for electric utilities to impress upon the public by consistent advertising and in every other way that they are doing the most possible with the little they can get.

Iowa Points the Way

THE contract which was agreed to by the Iowa Electric Light and Power Co. and eight Iowa rural electrification cooperatives, under which a $7,000,000 generating station will be federally financed and privately operated, is certainly a precedent-making document—in more ways than one.

For one thing, it makes very plain the fact that there can be cooperation in the over-all rural electrification job between co-ops and private companies, despite all the assertions to the contrary which have flowed from the headquarters of the Rural Electrification Administration during the past year.

There is considerable difference in detail between this move and those of the Arkansas Power and Light and Georgia Power companies in seeking to erect hydro-stations and dams at government sites. But is there much basic difference in what each move seeks to accomplish? In Iowa, the public-power conscious REA apparently decided that the best job could be done by having the company operate the generating station which is required. That is precisely the issue on which the AP&L and Georgia applications should be decided, whether by the Federal Power Commission or by the next Congress, in the form of new legislation.

That is precisely the issue on which appropriations for such proposals as the Southwestern Power Administration's five-state transmission grid should be decided, namely, who can do the best job. All things considered it is our firm conviction that the power companies can do the best job and from decisions honestly arrived at on such issues, the privately owned electric power industry should have little to fear.

WASHINGTON COMMENT

By R. N. LARKIN

LEGALISTS who wondered what would have happened had Pittsburgh's anti-power strike injunction been appealed may get part of an answer when the U. S. Supreme Court decides the appeal of John L. Lewis from his contempt conviction born of the recent coal strike.

The two cases are similar though not identical. In Pittsburgh, an independent union was enjoined from stopping electric service. Next would have been appeals to the state Supreme Court and the U. S. Supreme Court had the appellate gamut been run. Instead, the injunction was dissolved, unimpaired but unchallenged.

In the coal fight, an injunction forbade Lewis to permit a contract cancellation notice—tantamount to a strike call—to stand, and restrained any hindrance to coal output. But instead of being dismissed, the anti-Lewis injunction was appealed to the Supreme Court, with argument scheduled for January 14.

Basically, each case amounts to use of the injunctive process, despite legislation forbidding it, to eliminate a strike or strike threat. Pittsburgh's excuse was that the threat entailed a public calamity; in Washington it was the technical assertion that the law does not control the U. S. Government. The technical argument was justified, however, by the public calamity also implicit in the coal strike. Neither administration imaginably would use labor injunctions short of a public calamity.

Astute Pittsburgh sources believed that the city's injunction, if appealed, would be upheld by the state Supreme Court, but might well have been overruled by the U. S. Supreme Court. In the Lewis case, there seems reason to believe that the U. S. Supreme Court may uphold the injunction.

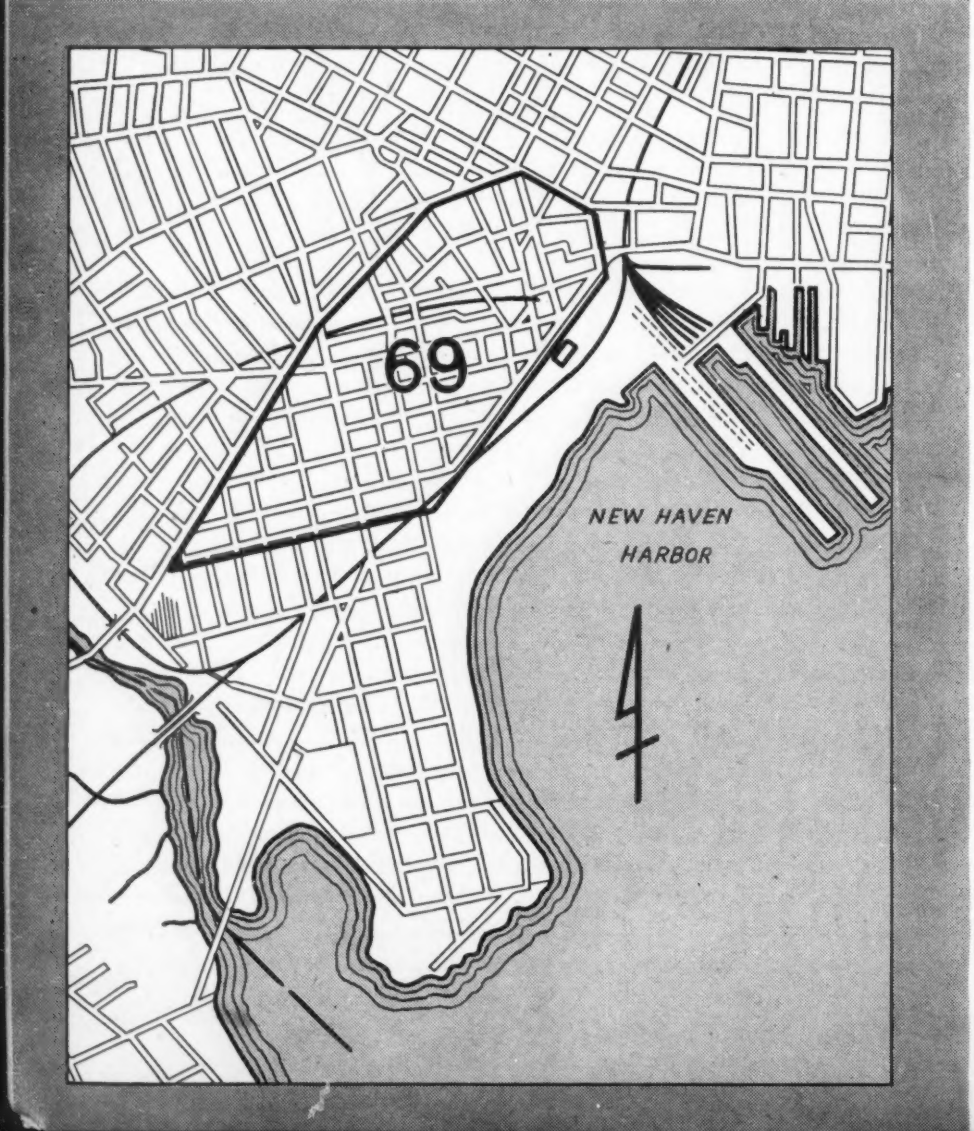
At least one factor in the Lewis case will make the ultimate decision less than precisely applicable to the Pittsburgh case. Lewis was enjoined after refusing to follow due legal process in determining whether the Krug-Lewis agreement could be terminated. No such element existed in Pittsburgh. Lewis' failure to enter court with all other legal remedies exhausted could be a qualification of the basic principle which so many want to see resolved. That is whether, notwithstanding labor-protective law to the contrary, courts may legally place the public interest above the right to strike when the exercise of such right would in fact seriously threaten a national calamity. There will be time enough to safeguard labor against the abuses such a policy could entail after the policy wins ultimate validation.

Mutual Assistance Plan

BY WAY of amplification of the following plan for mutual assistance it should be said that the procedure is already implemented by interchange of maps and standardized forms. The areas served by the electric and telephone utilities have been broken up into patrol and priority areas and these have been exchanged so that each force will know the details of the other's system in the area. Lists of priority users have been drawn up and exchanged. Forms have been printed and distributed so that patrolmen and supervisors can report both hazards and restoration steps in systematic manner. Various stages of responsibility and emergency decision have been established.

In this way it is confidently believed that the following cooperative arrangement will make for quicker, more effective and more orderly restoration if storms should again disrupt services of the two wire-using utilities over considerable areas. The plan is in operation, personnel assignments have been made and patrol areas designated. Blank patrol reports have been packaged with individual maps ready to be handed out to the patrol men. Plans, lists and maps will be brought up to date annually.

AREAS common to the two utilities are broken into patrol areas of 40 or 50 blocks that are defined on patrol maps as shown



The plan follows:

1.01 The general purpose of this plan is to provide for coordinated effort by the power and telephone companies in the restoration of their services after an emergency affecting a large number of customers of both. The ultimate object is to accomplish this restoration in as short a time as can reasonably be expected.

1.02 This plan is intended to apply to the several power companies separately with such modifications as to detailed application as may be necessary. Each power company's territory and the corresponding telephone company exchanges will be defined and indicated on a map to be prepared jointly by the two companies.

1.03 In communities where power company district or general headquarters are located, the telephone company will establish a district headquarters on an emergency basis where such a headquarters is not normally in operation. Normal organizations of both companies will be augmented as appropriate.

Preparatory Measures

2.01 Lists of key personnel are to be interchanged between companies. Details of these lists will include the general functions of each person included thereon together with office and home telephone numbers.

2.02 Each company will provide such maps as may be mutually agreed upon as of assistance in the emergency restoration activities outlined in this plan.

2.03 On the approach of an emergency of which advance warning is received, a designated individual of each company will communicate with the other to assure that both companies are cognizant of the danger and are prepared to set up any necessary mutual arrangements. At this time,

with Telephone Company

W. A. UPHAM, *Chief Engineer, The United Illuminating Co., New Haven, Conn.*

Against the prospect of repetition of the disruption attending the 1938 and 1944 hurricanes, the two local wire-using utilities have evolved a plan for mutual assistance in emergencies, for prompt and orderly interchange of plans, information and reports and coordination of activities of restoration forces

if the situation appears sufficiently serious. each company will appoint a coordinator to perform functions of liaison as hereinafter provided in paragraph 3.12. When no advance warning is received this contact will be made as soon as it is recognized that an emergency exists.

2.04 Lists of individual priority customers will be interchanged so that each company may know where the other may be expected to require immediate restoration of its service. Where it is felt that such information would be of value, power company lists will include a designation of those customers who are equipped with emergency standby service.

2.05 Information as to main feeder routes carried on jointly occupied poles will be interchanged in preparation for early joint action in restoration work on such plant if disarranged.

2.06 The plan is to be reviewed by both companies together at a prescribed time each year in order to make such changes as experience might indicate and to bring interchanged lists and data up to date.

Restoration Activities

3.01 As quickly as possible after the occurrence of an emergency a survey of damage is to be made to obtain the number, magnitude and location of plant derangements, including poles broken or leaning, trees in plant, section of electric light wire down, sections of telephone open wire down, crossarms broken, cable damaged, and, where desired, service wires or drop wires damaged.

3.02 The survey will be made by employees of both companies working separately and not in the same areas. The information obtained will be entered by those making the survey upon organized forms which are to be designed to show the information required by each company. From these forms the information will be made available immediately to each company. The areas covered by the survey will be set up on maps provided under paragraph 2.02 of this plan. Where practicable these maps will include a tentative assignment of the area for survey as between companies, subject to such modification as may be required by conditions developing at the time of the emergency. Where no such assignment is practicable, assignment of the area as between companies will be made at the time of the emergency and will be based on conditions then known to exist.

3.03 Before starting the survey the employees selected to make it will be given simple and brief instructions as to what to report and how to post the forms. Where advance warning of the emergency is received, this may be done previous to the actual occurrence of the emergency.

3.04 Supplies used by both companies, particularly poles and guying materials, will be interchanged as necessary. This will be arranged with the company furnishing the item in question through its coordinator.

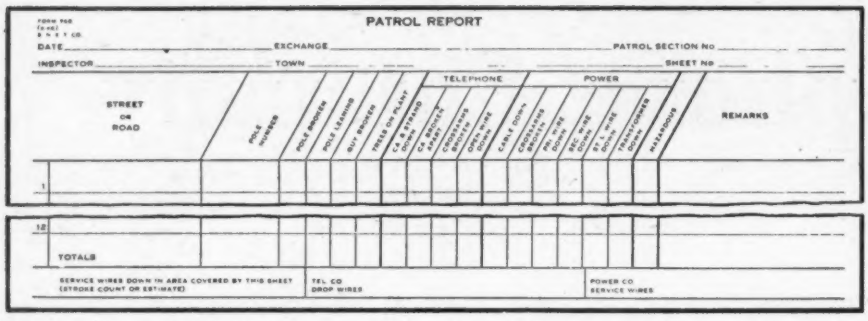
3.05 Each company will inform the other if extra linemen qualified for its work are needed. In such case each company will refer to the other any "floating" linemen who may apply for employment who are best qualified for the other company's work.

3.06 Contract crews will be subject to interchange between companies. Generally this will not be neces-

Cooperation in Emergencies

HECTIC CONDITIONS followed the 1938 and 1944 hurricanes and frantic efforts were made to clear up damage and restore service in the New England area. Admittedly power and telephone utility moves were not too well coordinated, simply because of absence of plans, and the respective services were not reestablished to the greatest number of customers in the least possible time, despite the strenuous attempts made independently by each utility.

In an endeavor to improve operations under similar emergency circumstances, a special committee was appointed by the Joint Committee on Plant Coordination of Edison Electric Institute and the Bell System. Among the initial results of deliberation by that committee and local subcommittees is the accompanying (verbatim) plan for mutual assistance between the electric utilities of Connecticut and the state-wide Southern New England Telephone Co., as framed for application in the New Haven and Bridgeport areas served both by the United Illuminating Co. and the telephone company—The Editors


PATROL REPORT

DATE _____ EXCHANGE _____ PATROL SECTION NO _____

INSPECTOR _____ TOWN _____ SHEET NO _____

TELEPHONE | POWER

STREET OR ROAD | POLE NUMBER | POLE BROKEN | POLE LEANING | GUY BROKEN | TREES ON PLANT | CA & STRAND DOWN | CA & STRAND CLEARANCE | CROSSARMS BROKEN | OPEN WIRE DOWN | CABLE DOWN | CROSSARMS BROKEN | PRI. WIRE DOWN | SEC. WIRE DOWN | BOLT WIRE DOWN | TRANSFORMERS DOWN | HAZARDOUS | REMARKS

1

12

TOTALS

SERVICE WIRES DOWN IN AREA COVERED BY THIS SHEET (STROKE COUNT OR ESTIMATE) | TEL. CO. DROP WIRES | POWER CO. SERVICE WIRES

EACH PATROLMAN'S KIT contains a map of the assigned patrol area and a pad of blanks for reporting conditions found on power or telephone systems

sary except in the case of tree contractors. In such case little interchange is to be expected in view of the fact that much of the tree work is on joint plant. It is assumed that each company maintains lists of tree contractors and municipal authorities who may be called upon for assistance under emergency conditions.

3.07 Where unusual numbers of workmen are to be housed in a community, which may involve overcrowding, housing agents appointed by each company will cooperate to effect an equitable division of the available facilities.

3.08 Where expedient because of the nature of the restoration problems, pole replacements will be made by either company regardless of custodianship.

3.09 Wherever tree trimming or removal work is done on joint plant, generally the facilities of both companies will be cleared regardless of which company's crew is actually doing the work.

3.10 In caring for individual priority customers, each company will follow its own priority list. However, each company will so cooperate with the other as to facilitate early restoration to all priority customers of both. Where necessary, individual cases shall be handled through the coordinators.

3.11 Sequence of restoration by each company insofar as it affects the other will be arranged at the time of the emergency in accordance with conditions then existing. Special arrangements shall be made through the coordinators.

3.12 Immediately upon the development of an emergency requiring the operation of this plan or in advance of such emergency if warning is received of its approach (see paragraph 2.03), each company will appoint an individual to act as a coordinator with the other. The qualifications of this individual will be:

(a) He will be well grounded in outside plant problems of his own company and generally familiar with those of the other company.

(b) He will be familiar with the policies of both companies.

(c) He will be thoroughly acquainted with the territory common to both companies.

Where communications between different parts of the area covered by this plan are so disrupted as seriously to hamper coordination work, additional coordinators will be set up as required and will function until restoration of communications permits the work to be centralized.

Coordinators' Duties

3.13 It will be the duty of the coordinators to serve as contact points to arrange for the prompt meeting of all situations requiring joint action so as to avoid unnecessary delays to either company's forces.

3.14 Each coordinator will be located within or convenient to the dispatching center of his own company. A telephone private line for direct connection between the coordinators will be installed and each will be provided with regular telephone service to the exchange or P.B.X. of his company. The telephone services will be provided by the telephone company immediately upon development of the emergency or before such development if sufficient prior warning is received.

4.01 In time of emergency, the power company will deenergize circuits known to be in dangerous condition, as learned from patrols, employees' reports or reports by authorized public agencies.

4.02 Both companies will use all possible means to warn the public against coming in contact with fallen wires of any kind.

4.03 Each company will advise the other of observed actual or potential property damage due to the other's plant.

4.04 The deenergizing of any power circuits or portions thereof to permit work to be done by telephone company personnel will be considered by the power company upon request of the telephone company. Decision as to whether to deenergize such a circuit will be on the basis of the length and importance of the circuit and the possibility of some different method being employed whereby the work may be done safely with the power circuits being left energized. Power circuits deenergized under this provision will not be reenergized until assurance is had that all telephone employees are in the clear.

4.05 Except as provided in the foregoing paragraph 4.04, power circuits which have been deenergized incident to the emergency either at substations or other points will be reenergized only after it has been determined by actual patrol that such circuits are in safe condition. Questions as to whether or not a given circuit is energized and the answers thereto will be routed through the coordinators.

4.06 The telephone company in particular will continually emphasize to all employees the probable grave consequences of personal contact with power circuits, either directly or through crosses between power and telephone plant, and will warn them to use every precaution to avoid all possibility of such contact and to observe all safety requirements.

Public Relations

5.01 Insofar as possible, restoration of service will be synchronized between the two companies by areas or localities. The accomplishment of this will be one of the duties of the coordinators.

5.02 Each company will endeavor to keep its employees generally informed as to the other company's problems in order that they may answer inquiries regarding such matters intelligently and all will be advised to avoid making statements which might be taken as criticisms of the other company's accomplishments.

AERIAL CABLE provides ample clearance above street without going above tree limbs

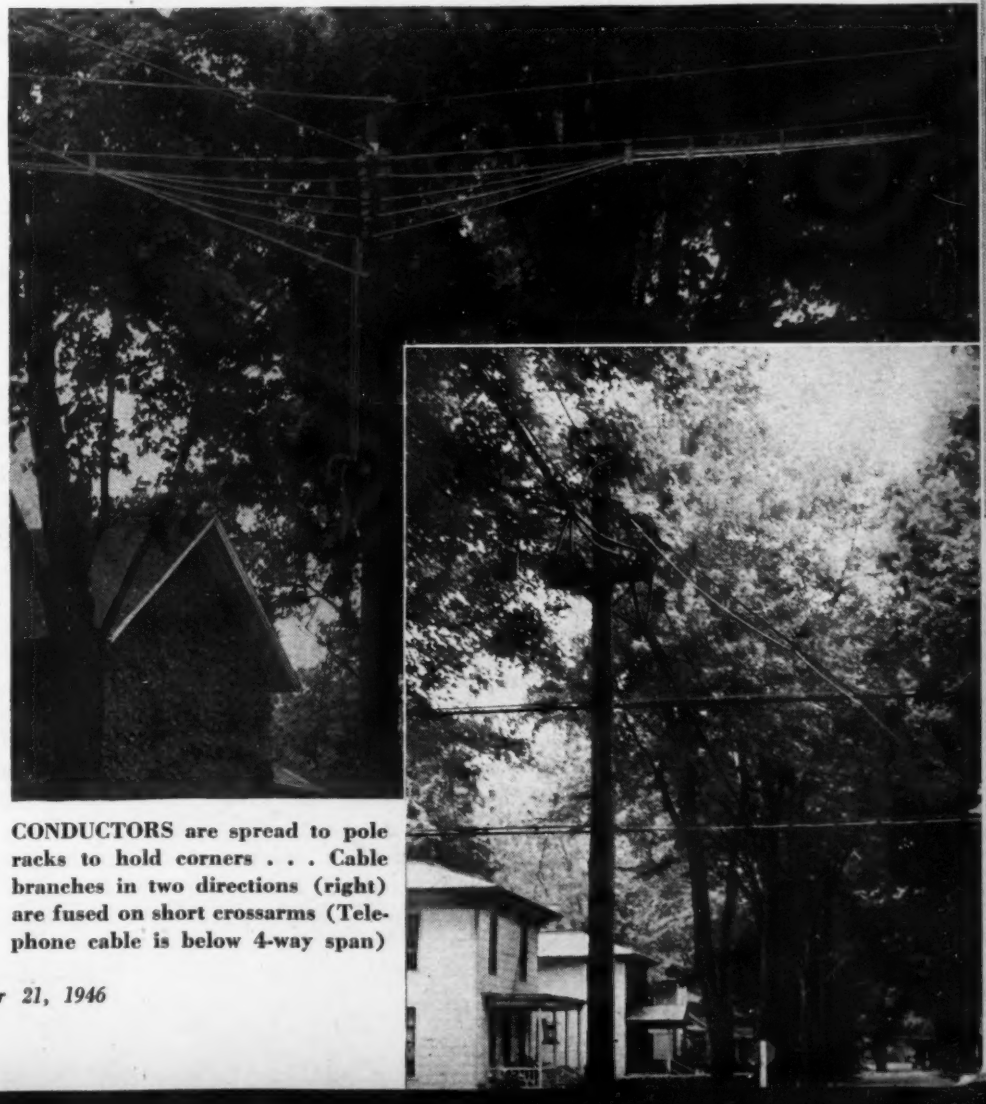
MESSENGER-SUPPORTED WIRES Serve Without Storm Interruptions

Twenty-year experience . . . Permits staying under trees . . . No lightning trouble . . . Only one case of trouble in trees

L. E. McQUEEN
Superintendent
Dept. of Water & Electricity
City of Coldwater, Mich.

AERIAL CABLE distribution is receiving considerable attention as a means of increasing reliability in sections of heavy trees. There are, however, rather meager operating records for long periods of installation. Our experience with messenger supported line in Coldwater, starting in 1926, may be of interest to others contemplating this type of construction.

Objectives in our original planning were to obtain freedom from outages caused by trees and lightning. Four circuits from the generating plant are arranged with tie switches at the outer ends to give a modified feeder-ring system. Trouble-free operation permits increased circuit capacity with a minimum of reserve line capacity. We felt that a 25-year life with the cabled construction would justify the increased cost compared to conventional



CONDUCTORS are spread to pole racks to hold corners . . . Cable branches in two directions (right) are fused on short crossarms (Telephone cable is below 4-way span)

CABLE is spread or fanned out to insulators on crossarms at transformer poles and same type conductor is used for riser leads

open wire. Our experience up to the present time justifies this basis of comparison.

Poles are relatively short, 30 and 35 ft., and in all cases the lines are below the tree limbs or through the lower branches. This construction offers many advantages compared to the alternatives of using poles high enough to go over the tops of trees or of trying to trim a clear space to go through trees with open wire on poles of average size used in residential areas.

No Storm Outages

There have been only two cases of trouble on the cable. One failure was caused by the cable rubbing against a heavy tree limb until the braid and insulation of two of the conductors were worn through. The other occurred when a derrick pulled the cable down while trees were being cleared after a heavy ice storm. The cable itself was not down or in trouble during two disastrous ice storms which caused heavy damage to trees along the line.

In a few cases, poles have been pulled over by heavy limbs or trees but in no case has the cable failed or the circuit tripped out. There have been no cases of lightning damage, although the cabled sections are tied to open wire sections at both ends. Arresters are used at all transformers, both in the open wire and the cable sections.

Construction Described

The feeders operate at 2,400 volts, two phase. Insulation is 10/64-in. rubber and outer covering is of the "tree-wire" type. The original conductor was No. 2 and all used since then is 3/0 (19 strand) medium hard drawn. Cables of four different manufacturers have been used in the various installations. One conductor of Kerite, with seine twine braid, and one of Simplex, with Fibrex covering, went into the 1926 installation. Four conductors of Fibrex tree wire were used for 6,000 ft. of construction in 1928. Rome Barkhide with standard braid and an oxide paint finish was used for another installation in 1930, and Okonite, with Okolite tape and seine twine braid, was used in 1934. Two conductors of Simplex, with 60 percent Anoroc rubber and one seine twine braid, were added to the original circuit in 1939.

Supporting messenger is $\frac{3}{8}$-in., high-strength, double-galvanized, steel strand rated at 10,800 lb. Hangers are of the A.T.&T. type with 3-ply tarred marline and galvanized hooks at 12-in. spacing. Metal rings were not used because it was felt that at this voltage there would be damaging electrical stress at the point of contact on the insulation. Average life of the marline has been about eight years. The greatest deteriorant to both marline and the braid has been caused by squirrels and blackbirds. We have also noted relatively more deterioration of the braid where it is in the open. Sunshine bakes out the compound and exposes the braid.

Taps Easy to Make

On poles where transformers are to be installed or branch lines are to be tapped, the four conductors are spread or fanned out to insulators on a crossarm. The same conductors are used as risers, supported on pin insulators on the pole. All taps and splices are covered with Kerite tape and rubber filled tape, and coated with asphalt paint.

No special precautions are taken at the junctions of cable and open wire other than sealing down the cut ends of the insulation.

In several short sections of open wire line the tree wire has been mounted on porcelain insulators of the pin type, now and then being marlined at 12-in. intervals into self-supporting bundles in order to avoid limb contacts.

At intervals of approximately eight years each such installation requires replacement of all exposed marline. At such times all tapings and other painted work are given a coat of high grade asphaltum paint as a preservative.

Conversion Contemplated

All work of this type installed thus far in Coldwater has been designed for 5,000 volts working pressure, pending the eventual conversion of the present 2,400-volt, 2-phase, 4-wire system to a 2,400/4,160-volt, 3-phase, 4-wire system. However, none of the present conductors are of the shielded type and there may be some question as to how well they will perform unshielded under the conditions attending the contemplated construction.

We are presently considering a new installation, about 5,000 circuit ft., of No. 2, 4-conductor cable. For this we are giving thought to the use of a shielded, multiple conductor cable of the cable and messenger preassembled type in lieu of our past design.

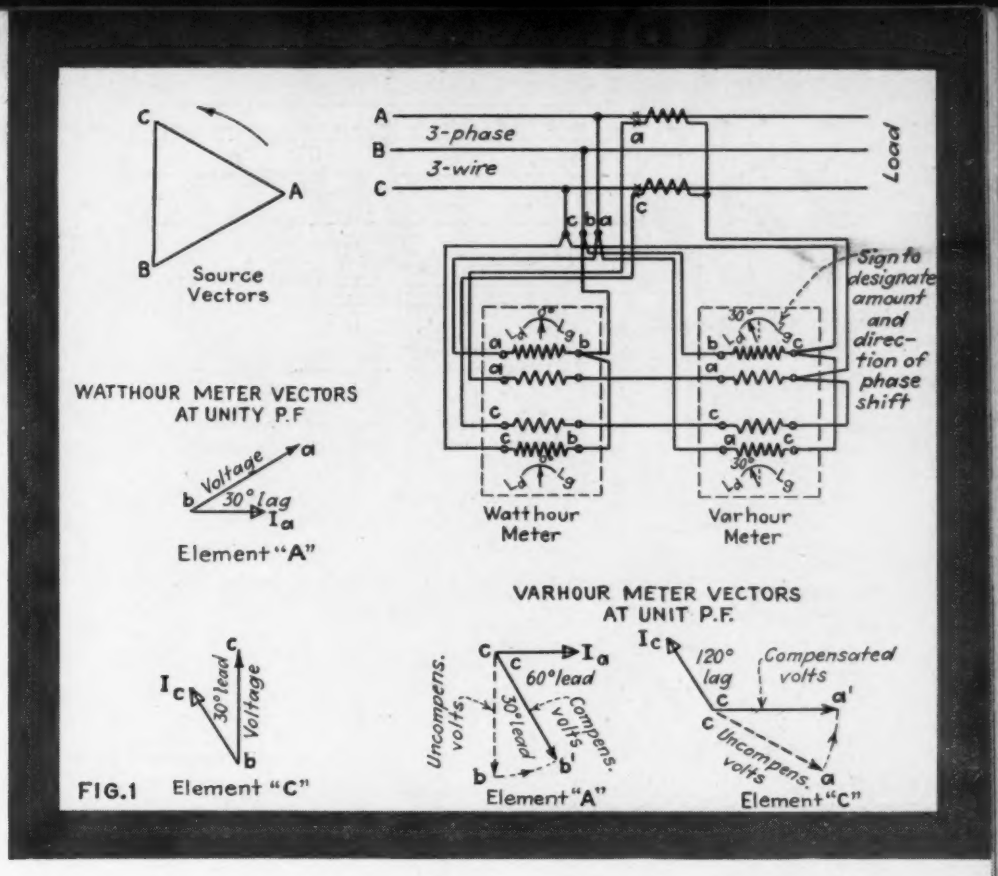


FIG. 1—Connections and corresponding meter vectors at unity power factor, balanced voltages and loads, for watthour and varhour metering without var-compensators. This will be possible when meters with "lead 35 deg.-0 deg.-35 deg. lag" phase-angle compensators are made available. Varhour meters will then, as watthour meters do now, register correctly regardless of voltage and load balance. It is assumed that the effective meter voltage is equal to the applied, within commercial accuracy limits, regardless of the degree of shift

NEED EXPRESSED *for* Versatile Watthour Meter

E. C. GOODALE, *Bonneville Power Administration, Portland, Ore.*

A case for a watthour meter with 35-deg. lead, 35-deg. lag, phase-angle shifter suitable for measuring both watthours and varhours

MEASUREMENTS and bookkeeping balances in the transmission of electric energy are best expressed in terms of watthours and varhours, metered with watthour and varhour meters. Usually the latter is a watthour meter with its potential source shifted 90 deg. lagging its true phase relation. In polyphase circuits this is usually done with a phase shifting var-compensator. This method is cumbersome, inexact, and often requires additional potential transformers for the var-compensator source. A much simpler method, illustrated in Fig. 1 and 2, consists in making use of the same source as the watthour meter, eliminating the var-compensator entirely. This is made possible when the watthour meter has a wide-range (such as "lead 35-deg.—0-deg.—35-deg. lag") phase-angle adjuster, built into the potential (or current) magnetic circuit.

Ordinary watthour meters already have this adjuster, but its range is limited to too low a value to be of any use in this application. Usually the range is only from ½ to 8 deg.

An ideal meter would be one that has a 35—0—35-deg. range with a small dial to indicate the approximate compensation used within this range. The exact compensation will be determined by test, as described later. The indicator would be set at 30-deg. lead for the varhour meters of Fig. 1 and 2. Movement should be by a simple and accurate mechanical adjustment, with a minimum of slack, and sensitivity such that adjustments as low as two minutes of phase angle may be made.

Interstation Transfers

When data or record metering of balanced high-voltage loads in an interstation tie line or on large high-voltage feeders is required, a considerable saving in the cost of additional high-voltage potential transformers may be effected by using single-element metering. When the circuit is three-phase three-wire and there is no line-to-neutral potential source, single-element metering may still be effected if a meter is available that has a high-range phase compensator, such as the 35—0—35-deg. previously described, by shifting the meter potential 30 deg. either lead or lag, depending upon the phase of the available potential.

Combination Two-Rate Metering

It is being recognized that equitable billing of electric energy consists in charging the customer for the watthours with watt demand and the varhours with var demand, as separate quantities. For example, the watthours may be sold for 5 mills per thousand and the varhours for 1 mill per thousand.* Ordinarily this involves the use of two meters, one

* "Kilowatts, Kilovars, and System Investments," by J. W. Butler; A.I.E.E. Transactions, Vol. 62, pp. 133 to 137.

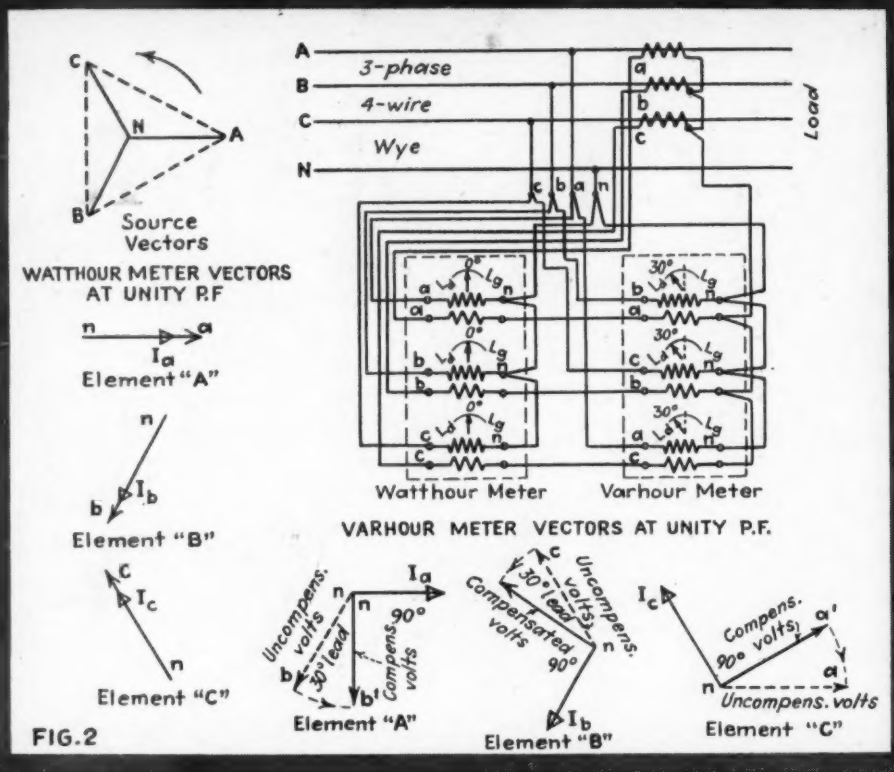


FIG.2

FIG. 2—Connections and phase relations for three-phase, four-wire-Y power and reactive metering without the use of var-compensators. The conditions correspond to those of Fig. 1. Both meters are identical in internal construction. Either could be used for the combination two-rate metering. The connections would be the same as for the watthour meter in this figure

for the watthours and watt demand, the other for the varhours and var demand. A method of using an external network with an ordinary watthour meter to meter a combination of these quantities has been developed by a leading manufacturer. The potential to the meter is lagged from its normal (watthour meter) phase position by an angle, ϕ, whose tangent is equal to R_v/R_w, where R_v is the varhour rate and R_w is the watthour rate to be applied to the customer's energy requirements. For example, if R_v is 1 mill and R_w is 5 mills, tan ϕ is 1/5 and ϕ is 11 deg. 19 min.

Wide-Range Compensator

A much simpler meter installation can be made if a wide-range phase-angle compensator is available in the meter. The meter may then be connected the same as the watthour meter of Fig. 1 or Fig. 2. The phase shift is made by micrometer screw adjustment to the required value. Fig. 2 illustrates the effect of shifting the effective meter potential by an angle, ϕ, whose tangent is R_v/R_w.

The true power is EI cos θ

The metered power is

$$E_mI \cos (\theta - \phi)$$

hence the metered power is

$$E_mI (\cos\theta\cos\phi + \sin\theta\sin\phi)$$

In this case voltage E is numerically equal to E_m and the above quantity may be multiplied by $\cos\phi/\cos\phi$. Then,

the metered power equals

$$EI \cos\phi (\cos\theta + (\sin\phi/\cos\phi) \sin\theta$$

and thus the metered power equals

$$\cos\phi(W + (R_v/R_w) V).$$

In this case W is the watt-load and V is the var-load.

By adjusting the meter magnets so that the meter will register 100 percent/cosϕ prior to the phase compensation, the metered power will be equal to $W + (R_v/R_w)V$, after the phase compensation. Thus a single meter, without external phase compensator and connected like an ordinary watthour meter, may be used to bill a customer at the regular watt-energy rate for all of his watt energy plus a fraction of his var energy, the fraction being the ratio, R_v/R_w. Such a meter, correctly calibrated, should register 100 percent of the watt energy passing through it at unity power factor. Furthermore, the following relation should hold: (regis. 60-deg. lag minus regis., 60-deg. lead)/(regis., 60-deg. lag plus regis., 60-deg. lead) is equal to tan $\phi \sqrt{3}$.

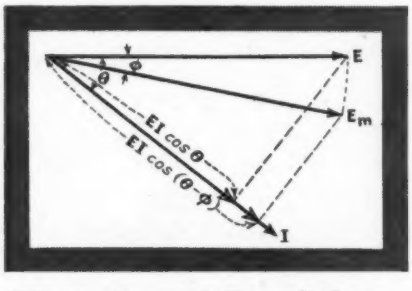


FIG. 3—Potential, E, applied to a meter is shifted internally by angle ϕ to assume an effective phase position, E_m. This results in the meter registering the watt-energy of the circuit plus R_v/R_w times the var-energy. R_v is the basic var-rate and R_w the basic watt-rate. (It is necessary to compensate the meter magnets for a registration of 100 percent/cosϕ at unity power factor)

Conclusions

Meters designed so that the phase of the potential or current or both supplied to the meter may be changed by simple and accurate mechanical adjustment on the magnetic circuit of the meter itself, over a range of at least 35 deg., lead and lag, are seriously needed. Such a meter may be used as a varhour meter without external compensator for three-phase three-wire and three-phase four-wire circuits. A potential 120-deg. lagging is applied to the meter and its potential phase-adjuster calibrated for a 30-deg. lead to give a net lag of 90 deg. in service.

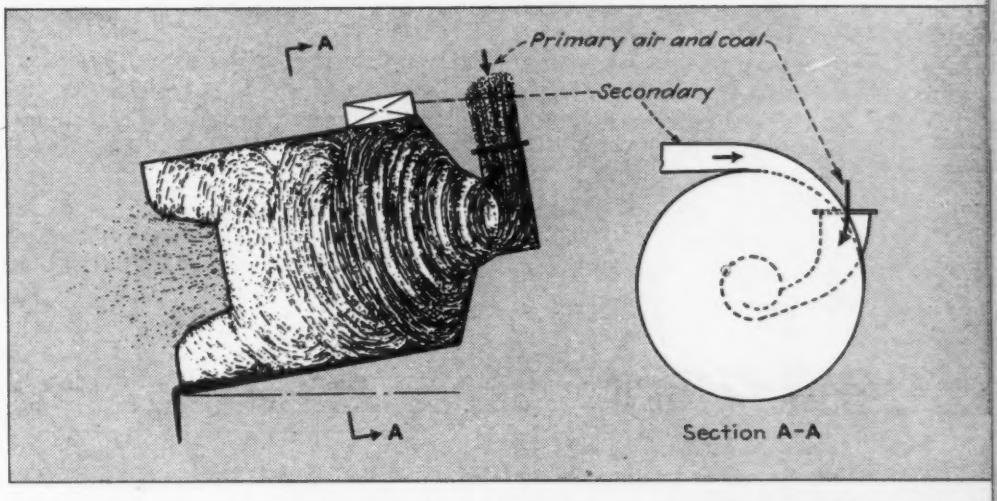
Such a meter may be used to correct for the phase-angle errors of low ratio bushing current transformers or inaccurate instrument transformers of any kind over predetermined load ranges. It may be used for station metering when the only available potential source is as much as 30 deg. out of phase with the desired source. This application includes its use on single-element metering of balanced delta loads when line-to-neutral voltage is not available.

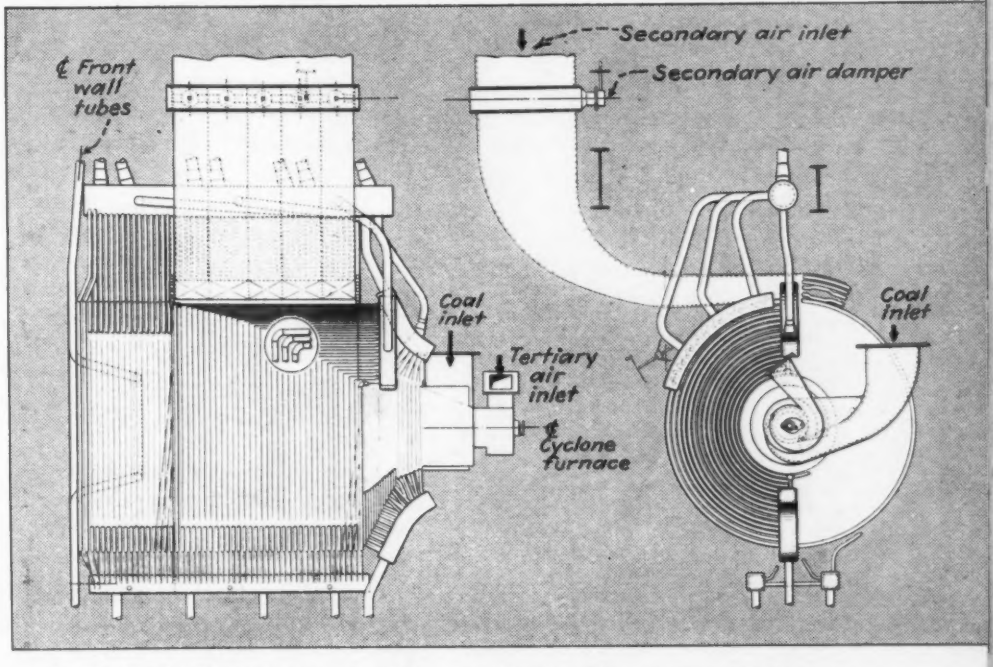
Such a meter may be used for two-rate power customer billing of watthours with or without watt demand and varhours with or without the corresponding var demand. This use, alone, should insure sufficient demand for the meters to justify development and manufacture.

CYCLONE BURNER

Eases Slag and Dust Problem, Saves Space

Evolutionary development at Calumet Station of furnace designed specifically to burn crushed coal results in great reduction in slag deposits in steam generator, in fly ash emission, in size and weight of boiler, in building area and volume. Savings of better than $6 per kilowatt indicated. Pulverizing of coal not necessary





SCHEMATIC DIAGRAM of principle of inclined cyclone burner which traps most of slag before gases enter boiler proper. Fuel and air admitted tangentially. Cross section of cyclone (below) installed on 600-psi., 900-F., 150,000-lb. per hr. boiler in Calumet Station

IMPORTANT SAVINGS in boiler maintenance time and labor, in boiler size and weight in building volume, along with reduction in stack dust, are indicated by release test results on a cyclone furnace at Calumet Station of Commonwealth Edison Co. The development is a joint venture of that utility, Sargent & Lundy and the Babcock & Wilcox Co. and fuller details are disclosed in a contemporary A.S.M.E. paper by A. E. Grunert, L. Skog and L. S. Wilcoxson, representing the three participants.

Results have been so gratifying that the following conclusions have been drawn:

1. That, due to the segregation of better than 80 percent of the ash in the coal as molten slag in the burner itself, and its removal therefrom in molten form, the ash handling problem in the burning of coal in public utility and large industrial units is greatly simplified both as to equipment installed and labor requirements for its removal.

2. That the reduced quantity of fly ash in the gases discharged from the stack—amounting to between 600 and 700 grains per 1,000 cu. ft. stack gases at normal temperature and pressure—requires, if anything, only a greatly simplified form of dust separation equipment, and obvi-

ates the necessity for costly equipment with its operating and maintenance expense.

3. That the discharge of relatively clean gases of combustion from the burner to the boiler unit permits rearrangement of heat absorbing surface with substantial reduction of both equipment and labor for cleaning the absorbing surface.

4. That such rearrangement of heat absorption surface results in a smaller unit for the same capacity when compared with other methods of combustion.

5. That the substitution of a lower first cost and lower operating and maintenance cost coal-crusher represents a saving as compared with the higher first cost, higher operating and maintenance cost pulverizers as used for pulverized coal firing.

6. That it appears feasible to operate such units with the products of combustion under pressure with possible elimination of the cost, operation and the maintenance of the induced draft fan.

Advantages

Predicated on the above conclusions, a comparison between cyclone burner and pulverized coal-fired, high-pressure, high-temperature steam generating units for a new installation of 75,000-kw. capacity shows the following advantages attributable to the cyclone burner:

1. A reduction in the floor area required of approximately 25 percent.

2. A reduction in building volume of approximately 33 percent.

3. A reduction in weight of approximately 22 percent.

These anticipated reductions in building dimensions represent appreciable savings in cost, which, when combined with the other savings enumerated above, collectively show an estimated saving in capital cost, from all sources, of from $6.00 to $6.50 per kw. or about $500,000 for a 75,000-kw. plant.

It was in September, 1944, that the cyclone furnace was installed, in conjunction with the radiant boiler, at Calumet Station following studies carried out on a 5-ft. diameter pilot unit at the Barberton plant of Babcock & Wilcox. The Calumet unit is cylindrical in shape, 8 ft. in diameter and 11 ft. long, the axis sloping 5 deg. from the horizontal to facilitate draining the slag. As shown in Fig. 1, the burner, arranged for natural circulation, has a primary air and coal inlet port on the front end, secondary air port section along the upper burner periphery and an outlet throat section to discharge the hot gases into one boiler. A continuous slag tap opening is provided at the bottom.

Primary, secondary and tertiary ducts furnish air at between 30- and 40-in. water pressure, the primary and tertiary ducts being connected tangentially and provided with adjustable velocity dampers. The coal (Kincaid with 15 percent moisture, 13.4 percent ash and 10,034 Btu. as fired) is merely crushed to pass through a No. 4 mesh. The heated (450 F.) air results in high combustion rates and the ash is deposited in a molten state centrifugally on the walls of the cyclone. In fact, the slag coats the entire inner surface of the cyclone and it is drained off to an extent equal to some 81 percent of the calculated weight of ash in the coal fired. Approximately 7.5 percent is discharged as fly ash at normal 150,000-lb. per hour output of the boiler. The stack emission may run up to 10 percent during the infrequent soot-blowing periods. The remaining 9 percent, apparently unaccounted for, is attributed to change in such components as iron and sulphur, in part, to volatile or gaseous reaction products.

Control and Firing

As the molten slag coating is established the incoming coal is partly caught by the slag, the viscosity of which results in slow movement of the slag coating. The phenomenon provides an intense scrubbing of the high velocity air on the entrapped coal particles. Much of the high rate of combustion is attributed to this action.

Combustion control is effected through the medium of the manual control of (1) induced-draft fan, (2) forced-draft fan, (3) fuel feeder speed, (4) attemperator, and (5) desuper-heater bypass valves along with automatic control of (6) furnace draft, (7) final steam temperature and (8) automatic proportioning of fuel feed to total air.

Starting in 3½ hours has proven feasible with the cyclone burner by firing intermittently during 5-min. periods at 20-in. intervals. Coal ignition is obtained by use of a removable air-atomizing oil burner inserted at the front in proximity to the periphery of the cyclone burner. The oil burner itself is ignited with a wick-type torch, the use of which necessitates reducing air flow to minimum and adjusting furnace draft to practically zero. Coal ignition occurs almost immediately with the possible exception of the initial lighting of a cold furnace, and there is no tendency to puff or flare back. As soon as ignition of coal is sustained, the oil burner is removed from the furnace. Fuel oil requirements have been about 75 gal. (140,000 Btu. per gal.) per unit firing up.

During the 5-min. starting-up periods, coal is fired at a rate approximately equivalent to 40,000-lb. per hour evaporation.

Ash Fluidity

Maintenance of ash fluidity at the cyclone burner tap is the most exacting of all operating considerations in the horizontal cyclone firing method. Burning Central Illinois coal of high volatile content and low ash fusion temperature at moderately uniform sizing has been accomplished with relative ease, but some experience with other coals has indicated the necessity for more rigid control, particularly when firing coals of higher ash fusion temperature. Three interruptions were incurred by fouling of the cyclone burner tap while experimetally burning Illinois screened coal of ⅜ in. to ⅞ in. before crushing. About 70 tons of Pocohontas coal of 23.3 percent volatile matter, as received, was burned. Best tapping results with Pocohontas coal were obtained at 8 percent excess air, and tapping from the secondary chamber was completely interrupted at 20 percent excess air. Ignition was lost on two occasions while burning a mixture of 25 percent coke breeze and 75 percent Illinois coal. This trouble was apparently due to inadequate mixing and tendency towards segregation of the fuels, with the result that on these occasions of lost ignition the fuel was essentially all coke breeze. Under these extreme conditions some of the coke was

transported through the cyclone burner and burned in the secondary chamber.

Boiler Cleaning

Boiler cleaning consists of occasional rodding of the cyclone burner bare-stud area, daily operation of four soot blowers in the secondary chamber, and thrice daily operation of the three soot blowers in the superheater section. During the early stages of operation, occasional hand lancing of the secondary superheater during unit outage was resorted to, but this was subsequently discontinued. In early operating practice, the bare-studded quadrant of the cyclone burner wall was rodded frequently. Slag accumulations in pendant form created disturbances in the cyclonic pattern of gas flow with resultant carrying of considerable solid material into the secondary chamber. Improved operating methods involving modified air distribution have practically eliminated the necessity for this cleaning operation.

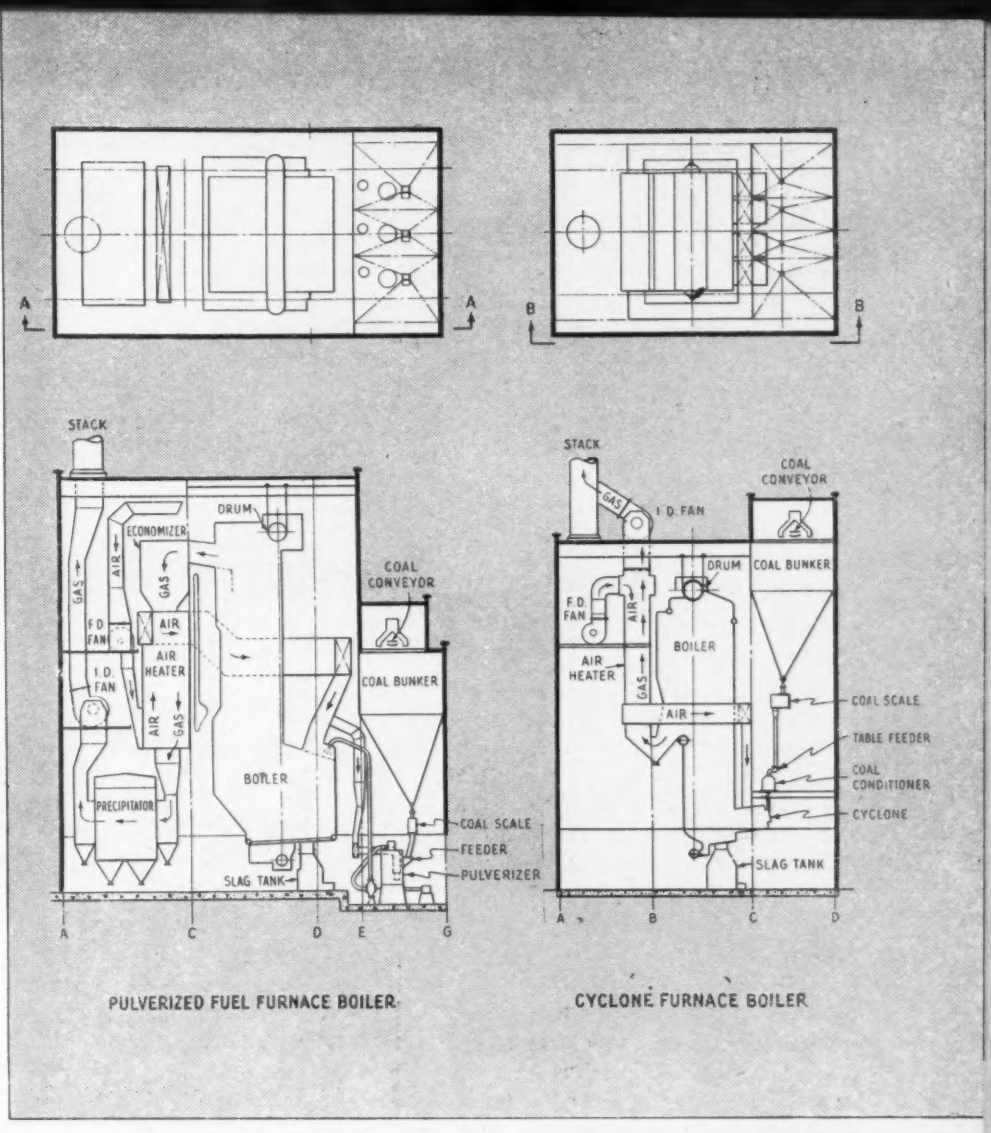
Dust accumulations in the secondary superheater section necessitated the installation of three soot blowers not provided in the original design. These superheater tubes are closely spaced, with 1-in. wide gas lanes. Dust precipitation on the tubes, if allowed to accumulate, becomes caked, falls, lodges in the lower part of the superheater and becomes difficult to remove. More than eight months have elapsed between hand cleanings of this section of the unit.

Operating Results

Results of the first year's operation under various imposed conditions may be summarized as having accomplished two major results. One, much development data was collected regarding performance and operating characteristics, and two, valuable experience in this new firing method was gained by the operating personnel.

Until August 29, 1946, the unit had accumulated 7,993 service hours with an availability of 76 percent. Distribution by days is as follows:

Days on header	403
Days available but not in service	128
Days' outage for scheduled repairs and alterations	110
Days' outage for emergency repairs due to cyclone burner	5
Days' outage for emergency repairs to auxiliaries	57
Gross days	703



APPLICATION of cyclone burner promises to save one-quarter of floor area, one-third of building volume and one-fifth of boiler tonnage. Thus for 75,000-kw., 1,325-psi., 935-F. unit requiring a 750,000-lb. per hr. boiler, the respective values for pulverized fuel and cyclone furnace installations are: Area 8,300 and 6,120 sq. ft., volume 1,058,000 and 722,000 cu. ft.

Availability is based on the sum of the first two items; however, much of the scheduled outage was not urgent and might be considered as available time.

Forty-eight service interruptions have occurred and are catalogued according to origin in the following tabulation:

Cyclone burner and burner assembly	7
Coal crusher	18
Feeder	13
Coal conveyor	4
Forced draft fan	4
Combustion control system	2
Total number of interruptions	48

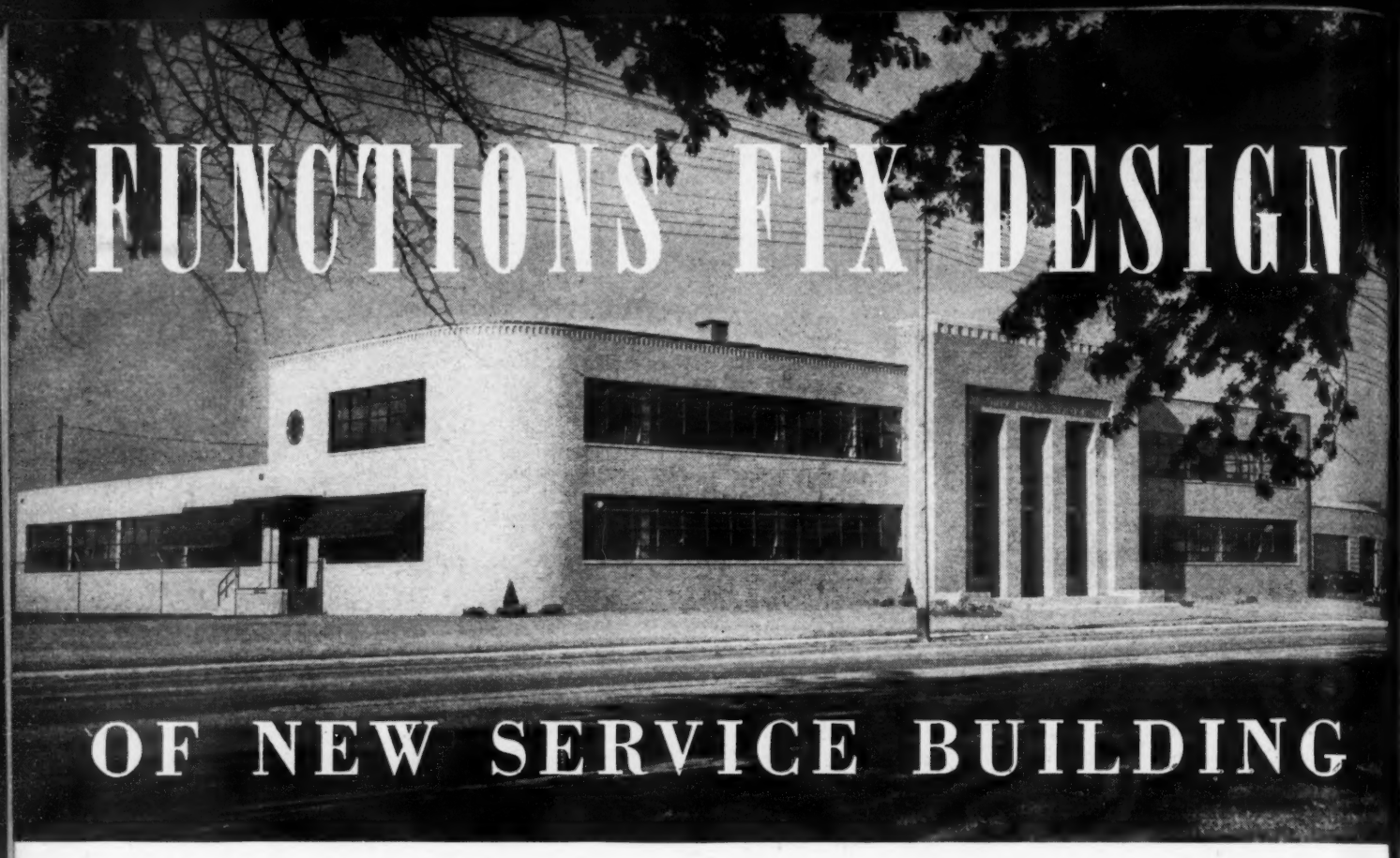
Burner Maintenance

Burner maintenance, excluding that of the fuel inlet region, has been practically negligible.

Provisions have been made for future installation of fuel port assembly affording renewable liner segments. There has been no maintenance of cyclone burner walls up to the present time.

The secondary chamber sidewall tap arrangement has involved considerable maintenance, due primarily to the fact that, in order to facilitate continuous tapping, furnace gases are circulated through the tap opening and ash tank hood into the air preheater. All exposed metal parts, such as cooling coil, refractory supports, water seal container, etc., have been subject to rapid deterioration. Life of some parts has been improved by substitution of alloy for the original steel, but this is not yet satisfactory. Inaccessibility to some of these parts makes repairs costly. One replacement of the secondary tap cooling coil has been necessary. These maintenance items would be largely, if not entirely, eliminated with the use of a bottom tap arrangement.

FUNCTIONS FIX DESIGN OF NEW SERVICE BUILDING



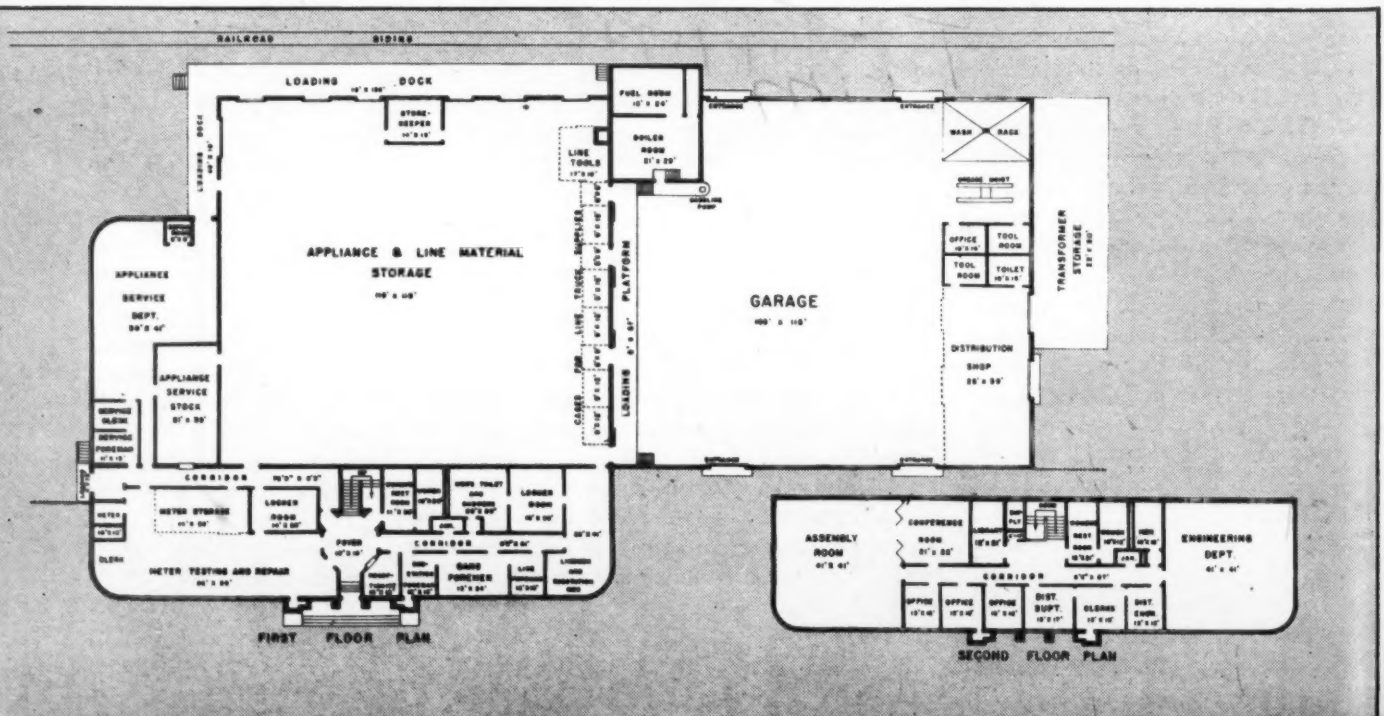
ACTIVITIES of the Warren division of the Ohio Public Service Co. now center around the company's new service building, which was made necessary by the company's outgrowing former quarters scattered throughout the city.

The new building which, including land, cost approximately $300,000, was designed by E. R. Smith, distribution superintendent, and his foremen after examining layouts of existing buildings for similar purpose in various parts of the country. The outside walls are of medium red brick with long horizontal window areas. The interior walls are mostly of glazed tile and the floors in hallways and offices of asphalt tile.

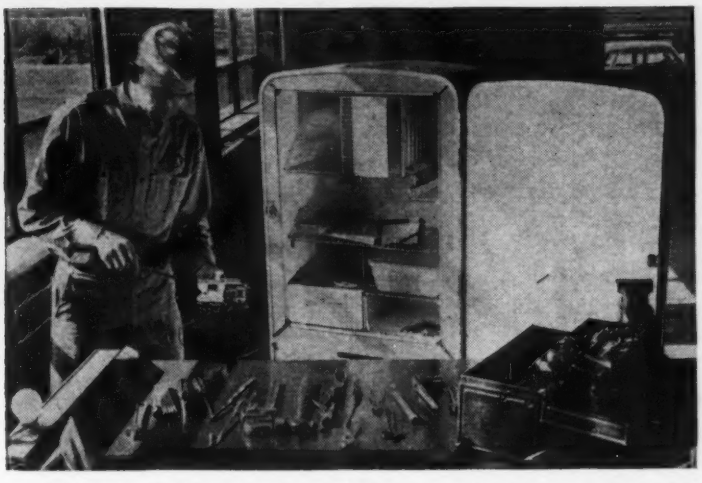
The appliance and the line material storage room and the garage account for most of the space on the first floor; the former is 119 by 118 ft., and the latter 103 by 118 ft. The garage has four entrances: two in front and two in the rear.

A feature of the storage room is the row of material cages placed along the wall just inside from the loading platform in the garage. Each cage, 9 by 12 ft., is numbered to correspond to a truck which parks in its assigned place handy to its cage. The storekeeper has access to the cages for placing material during the day for the next day's job. The storekeeper can thus schedule the filling of orders so that crews are not kept waiting for the materials in the morning.

PLAN OF BUILDING was determined by operations housed in it



OVERSIZE WINDOWS and ample overhead lighting provide illumination for engineering design work . . . Plenty of space in meter testing room for installation of additional facilities and equipment



PLENTY OF ROOM in the appliance repair department . . . No excuse for poor housekeeping in the new stockroom

RECEPTION LOBBY is simple and handsome with terrazzo floor and marble panel wainscoting . . . Large pole yard in rear of new building completes the service facilities

The opposite side of the store room is used for appliances and the appliance service department is immediately adjacent. An appliance loading dock 10 by 49 ft. is at the rear of the department and connects to the store room by an overhead door. This room also has six doors opening onto the loading dock, 10 by 132 ft., paralleling the railroad siding. Along the rear of the property and extending the full width is the pole storage yard, equally accessible to railroad siding and trucks. At the west end of the garage is the transformer storage area.

The east side of the front portion of the building is occupied by the meter testing, meter repair and meter storage department. The corresponding area on the west side is occupied by the substation foreman, gang foreman, line foreman, a lunch and recreation room for linemen and substation men, and women's and men's toilets, lockers and shower facilities. The second floor is occupied by the engineering and administrative groups, plus a large assembly room and an adjoining conference room.

PRIMARY DISTRIBUTION

Distribution at 4,150 volts eliminates former inadequacy—New system greatly improves voltage regulation—Much existing material re-used—New layout has greater flexibility

REVISING the power distribution system of this plant from 460 volts to 4,150 volts resolved the electrical insufficiencies and improved production continuity beyond our most optimistic expectations.

Typical of many medium-sized plants prior to the war, this plant was originally wired in 1928 to meet the requirements of the moment with a simple low-voltage radial distribution system, Fig. 1. Power was distributed at utilization voltage to distribution panels at load centers. Lighting current was distributed by 230-volt feeders and stepped down at the lighting panels to 125 volts. In addition this main lighting system served small 125-volt hand tools.

Flexibility Ignored

At the time the original system was installed the common practice was to provide only for the existing load, with a small amount of spare capacity at the centers of load concentration. The factor of flexibility was completely ignored. As manufacturing processes both changed and increased, new load centers developed and extended ever further away from the supply source.

The net result was an entirely inadequate system creating frequent problems in power handling along with production interruptions. As plant size increased, the increased copper cost in long heavy feeders joined with large power losses to cause uneasiness. Voltages at the loads ranged between 380 and 390 volts. During momentary peak loads, the voltage often dropped to near 370 volts, or 19½ percent, so low that unsatisfactory motor starting, speed regulation, and excessive temperature-rise problems were incessant. Synchronous motors would drop out and stall when more than 75 percent of rated load was applied. Breakers often tripped out, causing outages of whole sections. Proper feeds and speeds could not be maintained on machine tools.

Lighting circuits also were badly affected due to excessive drop and resulted in insufficient illumination.

Cable Faults

In addition to the foregoing, cable faults due to insulation breakdown caused by excessive temperature rise were not infrequent. Since there were no ties or loops the entire service area supplied by a faulted cable was interrupted until repairs could be made. This, of course, put a severe strain on production schedules, particularly when a fault developed on such a feeder as C, between the switchboard and building No. 9 (Fig. 1).

Considering all the difficulties enumerated above, it is probably not easy for the reader to understand why such a situation was tolerated, especially when the answer was so obvious. However, it must be remembered that the difficulties and problems caused by an inadequate and antiquated power system develop gradually and almost imperceptibly. The normal tendency is to rectify local and limited situations rather than engage in a major revision.

Transformer Locations

When the war came, power demand increased and outage causes had to be reduced to the absolute minimum. Transformer capacity had to be tripled and improved voltage became a vital necessity.

Merely to locate this new transformer capacity at the original substation in the heating plant and to reinforce the existing 460-volt feeders with greatly enlarged copper would simply be postponing the inevitable. So that idea was abandoned immediately.

Various types of distribution systems could have been used to achieve the above factors and reliability "insurance" could have been carried to the point of providing a primary network with secondary loops.

However, cost and installation time was a consideration which we could not ignore and a system had to be installed that would provide the maximum reliability. This had to be done without incurring the added worry involved in the additional material required for paralleled primary feeders and network protectors at a time when shortages and delivery problems were acute.

Instead this new transformer capacity was spotted in locations about the plant where load centers would most probably develop according to the planning and installation of new production departments.

To this end, the distribution design shown in Fig. 2 was installed. All of the new transformer groups were connected by means of 4,150-volt feeders to the old 4,150-volt switchboard.

460-Volt Ties

However, obtaining greater flexibility and reliability was highly desirable and since the old 460-volt lines paralleled the new 4,150-volt feeders, it was decided to repair them and use them as secondary ties interconnecting the busbars of the various power centers. Thus, in the event of power failure at any one of the load centers, due to faults in either the 4,150-volt feeders or the transformers, power could be quickly restored by utilizing the ties from two other load centers.

Reduces Plant's Power Problems

WILLIAM G. NUTZEL, *Maintenance Engineer, Otis Elevator Co., Elevator Div., Harrison, N. J.*

Transformer capacity at the load centers would be ample to permit this, and the capacity of each secondary tie would be approximately 50 percent of the average demand at any load center. The secondary loop thus created by using the old feeders as ties could be used only in emergencies, but normal operation would be only by means of the primary feeders.

The installation was therefore made in accordance with this plan.

Isolating Faults

With this design of buses, parallels and loops, any primary or secondary feeder or transformer can be isolated, with the exception of the lighting circuits, without undue interruption.

Switchgear is locked in open position at one end of each tie in each substation. These are the operating ends of the ties and the other ends of the ties are all connected through switchgear locked in closed position to the busbars of the load center in the elevator cab shop, Fig. 2. This was done for the safety of plant electricians and also to avoid the uncertainty inherent in this type of connections.

Another feature of this secondary loop lies in the fact that as total plant load decreases, transformer groups can be cut out successively as their load decreases, thereby adjusting the over-all transformer capacity to the total demand. Core losses in the transformers not needed are eliminated.

The secondary loops, in addition to improving reliability, make momentary excess transformer capacity immediately available to supply load wherever transformers would otherwise be overloaded. However, the cross-connections tend to make all transformers supply current to a fault on a secondary feeder. Nevertheless this increased short-circuit current, requiring as it does higher interrupting-capacity circuit breakers, did not overshadow the other advantages.

Wherever possible, existing material was used, as for instance:

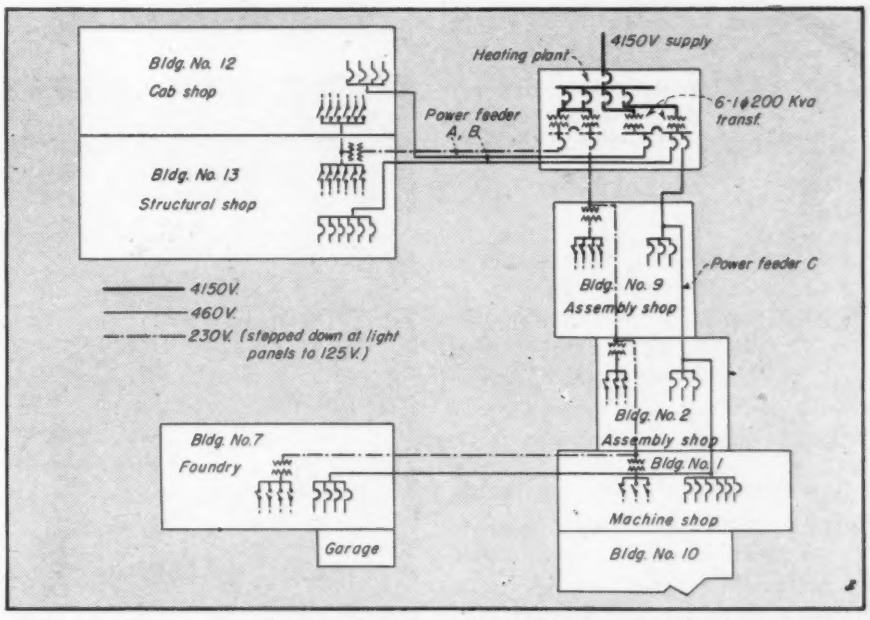


FIG. 1—Former installation, plot plan of Otis Elevator Co. Harrison Works, Elevator Div., showing power distribution at 460 volts

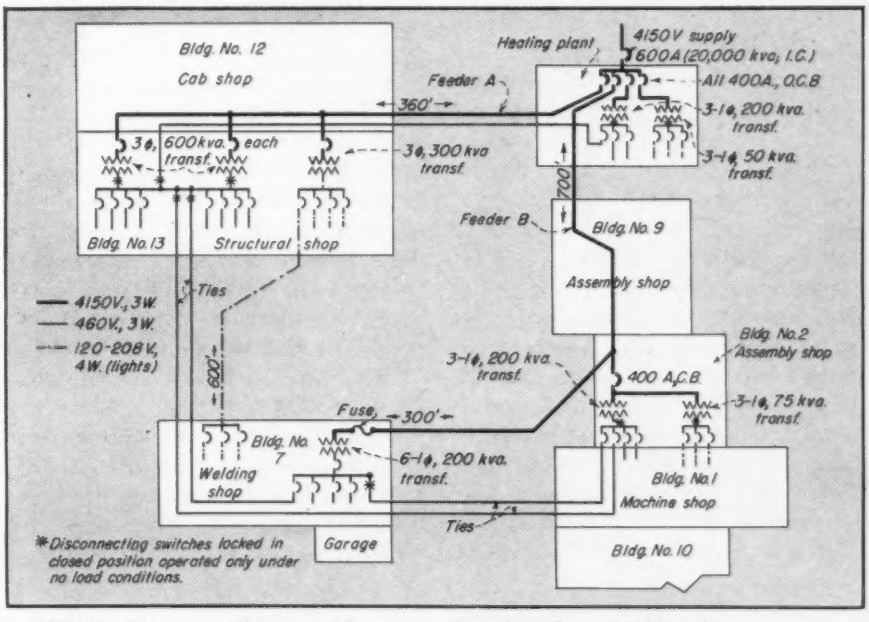


FIG. 2—New installation with power distributed at 4,150 volts

At the main switchboard in the heating plant building all the main circuit breakers were utilized. However, the switchboard wiring was reinforced. Many of the existing cables were used for the secondary ties. All of the old transformers were reused. They were divided into two groups one of which remained at heat-plant, the other being relocated in building No. 2. All existing distributing panels were re-used.

The actual change-over was completely accomplished on a Sunday with no production stoppage that was of any consequence.

HOW

DESIGN • CONSTRUCT • OPERATE • MAINTAIN

Photographing Conduits with Axial Coordinates

F. L. DENNIS
Engineer
Station Electrical Design Division
Boston Edison Co.

VIEW of conduits in control room of Mystic switching station during construction period, showing location of runs with respect to temporarily placed graduated scales which enable conduit to be spotted after floor construction is completed, regardless of changes which may be necessary or have occurred in pipe locations

TO PROVIDE lasting information as to the exact locations of conduits in building floor slabs, the Boston Edison Co. photographs newly installed layouts of this type during construction, particularly in its larger projects in generating and substation work. This enables accurate check-ups to be made of final conduit locations, which, due to field changes, installation variations or unforeseen obstacles, may differ from those shown on conduit plan drawings. Wooden rails graduated in feet are set up before pictures are taken and serve as scale coordinates to identify locations of conduit after pouring concrete or completing floor construction which conceals the piping. In congested areas, where several layers of conduit are installed, similar photographs are made of each layer.

In construction work involving an existing building, reference to the conduit plan drawing and one or two photographs of a particular area give both design and field engineers means to spot conduit locations in slabs accurately. With this information, clear areas may be selected for cutting the floor slab with less likelihood of personal injury and interruption of service from breaking into conduits containing the power or control cables.

As a further precaution the operator of an air hammer is provided with a bell signal or pocket buzzer, which sounds if the air hammer makes contact with metal conduit or building steel. He then proceeds with a hand chisel until the nature of the metal contacted is determined. A dry cell and buzzer are connected between the station ground and the air hammer to provide the required circuit. Fiber or other non-conducting conduits being installed in floor slabs are frequently covered with grounded wire mesh to provide for similar warnings. Fiber ducts, buried in earth but not encased in concrete, and buried cables are covered with creosoted planks to provide protecting warning during future excavations. It is considered that the above practices are desirable in the interest of safety, service continuity, protection from damages and, in addition, efficient design and field engineering.

• • •

Routine for Instrument Maintenance

ON A POWER SYSTEM serving between 50,000 and 75,000 customers a routine has been used with success for many years covering the maintenance of all switchboard instruments under the jurisdiction of the distribution superintendent. Naturally the meter department is responsible for tests, repairs and records, assisted when necessary by clerical aid from the distribution staff. A maintenance supervisor promptly informs the meter department when any such instrument is out of order.

The meter department inspects new installations of instruments before these are made alive, following meter department test and assembly of information for card records. The file has a card for each instrument in use, filed alphabetically by locations and sub-filed according to circuit or associated apparatus, i.e., all cards corresponding to instruments connected

to a particular circuit in a specified location are kept together. If auxiliary devices such as ammeter switches are included in an instrument, they are listed on its card.

Each October all switchboard instruments including watthour meters are tested. Instruments regularly read on all parts of the scale are tested at not less than five points on the scale. Ammeters and wattmeters on multiple circuits are examples. Instruments regularly read on only a small part of the scale are tested at that portion. Examples are voltmeters on multiple and ammeters on series circuits. Voltmeters for 2,300 volts and above are checked as a unit with their associated potential transformers, by using a potential transformer of known accuracy and making simultaneous readings. Any normal load on the installed potential transformer remains connected to it during the test. When tests are to be made on voltages above 2,300, the company's maintenance supervisor or a man so designated is present during the test.

When a switchboard instrument is tested, the meter superintendent or foreman has a test order prepared carrying information from the instrument record card. This order is given to the test man, who checks all its information; tests the instrument; records the results on the order and returns it to the meter foreman or meter superintendent. After the recipient examines this record of the completed test and causes the necessary entries and any required corrections to be made on the instrument card retained in the file, the test order is permitted to be destroyed.

• • •

Street Light Calculator Yields Lamp Life, Load

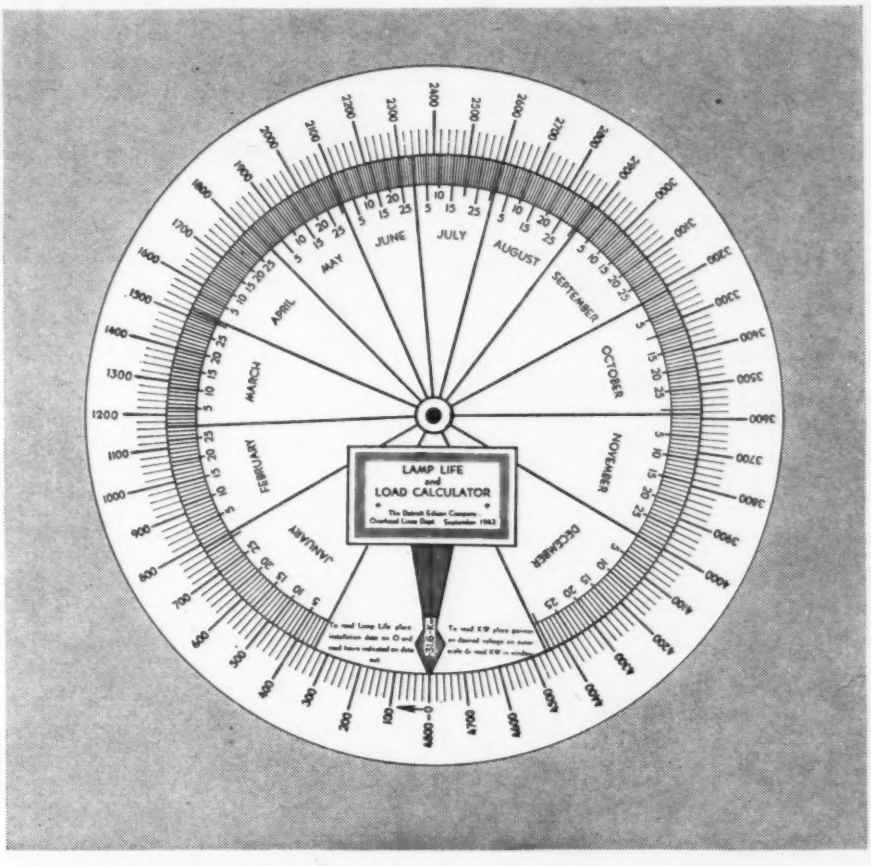
H. E. BROOKS, Overhead Lines Department, The Detroit Edison Co., Detroit, Mich.

A STREET light load calculator that eliminates pencil work in calculating burning hours and lamp life has been developed and used by the Detroit Edison Co. overhead lines department for several years.

The device, in the form of a circular slide rule, has three parts: (1) An outer uniform scale ranging from 0—4,800 units that represent either burning hours or voltage; (2) an inner (moving) astronomical scale covering months of the year and corrected for the longer burning hours during winter months; and (3) a kilowatt scale, visible through a window, that yields load on a constant current transformer based on 6.6-amp. setting.

Formerly to determine constant current transformer load it was necessary for linemen to multiply the ampere setting by the measured secondary voltage and divide by 1,000. With the calculator it is only necessary to set the arrow at the measured voltage and read load on the transformer in kw. directly in the window. A 6.6-amp. setting is assumed.

Lamps on the Detroit system are replaced approximately every 2,000 hours. It is desirable, therefore, to know the replacement date for new lamp installations. To make this determination using the rule, set the date of installation on the astronomical scale, opposite zero on the outer scale; and read the removal date opposite 2,000. Unknown burning hours for an old installed lamp will be found opposite the removal date.



STREET LIGHT SLIDE RULE—Replacement date for street lamps on any burning hour schedule are determined by this rule which also yields kw. load on constant current transformer (6.6-amp. setting) corresponding to any secondary voltage. Outer scale used for both burning hours and voltage

When December 31 is passed during the burning period it is necessary to move the inner calendar scale so that January 1 will show where December 31 originally showed. Need for this minor adjustment in using the chart was necessitated by interposing the lamp life chart over the voltage scale in designing the rule.

To make the calculators a large drawing of the rule was made and photographed. Prints were projected (somewhat reduced) on sensitized celluloid instead of photographic paper. Expansion and contraction of photographic paper in some cases threw the accuracy of the rule off 15 percent.

Original idea was taken from a lamp life chart by Electrical Testing Laboratories, converted to needs of this system showing burning hours in this area. Later other information was added, as indicated.

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Fluorescent Fixtures for Spartanburg's White Way

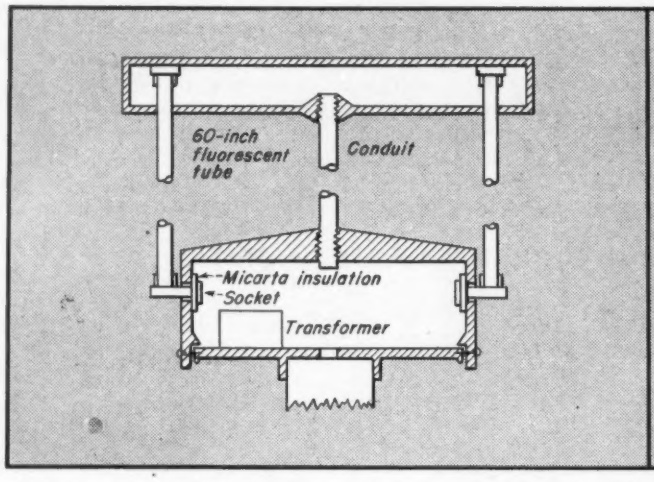


FIG. 1—Assembly relies on conduit to support the hood housing the upper sockets for the fluorescent tubes

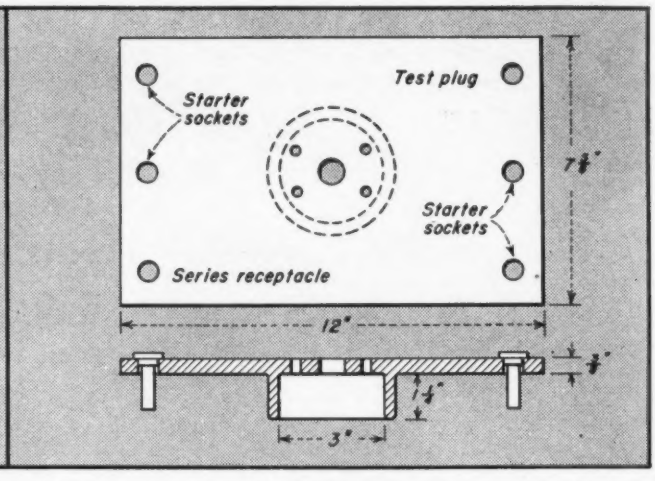


FIG. 2—Base of cast aluminum carries sockets for all accessories in accessible position

A. M. MILES
Miles Electrical Engineering Service
Spartanburg, S. C.

FOUR YEARS AGO the first trial was made of twin fluorescent tubes as sources for street illumination in Spartanburg. Since then approximately 60 units, each a pair of 60-in., 100-watt tubes, have been installed in the business section of the city. The fluorescent units are cut into the same 6.6-amp. series circuit which has been serving the incandescent luminaires.

Structure of Aluminum

The base (Fig. 1) is of cast aluminum and is set atop the concrete pole at right angles to curb line. The housing (Fig. 1) merely sits over the edge of the base plate, held in place by screws. Its top has four ribs to afford extra strength to carry the length of 1-in. conduit which supports the top member and acts as a duct for the leads to the two top-end cathodes.

To guard against injury to cars or pedestrians in the event that the fluorescent unit is jarred out of place, a piece of sturdy wire is attached to the top member and carried down through and to the lower end of the conduit. There is attached a piece of chain to afford flexibility if the unit is toppled over; the other end of the chain is fastened to the base.

Assurance that the tubes will start even in cold weather is afforded by the use of two starters in parallel for each lamp (Fig. 3). One is the Sylvania Mirostat M-6 with bimetallic armature that normally makes contact when the lamps are out but breaks the contact when the arc has struck. If, however, a momentary interruption should occur after the contacts have broken, the consequent high voltage induced by the series isolating transformer might arc across the gap and destroy the heater switch.

For this reason there is another device in parallel with the Mirostat which takes care of this exigency. It is essentially a modified (reversed) form of the General Electric "Watchdog" starter which is a gaseous tube that will flash across if the voltage rises due to the open circuit at the Mirostat. Each of the four starters is inserted in sockets in the base (Fig. 3) attached to the top of the concrete columns by means of bolts set in the concrete. All four are readily accessible for replacement because they project downward from the sockets.

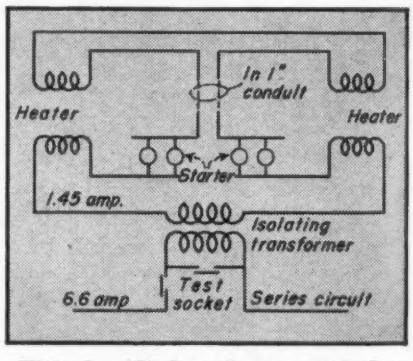
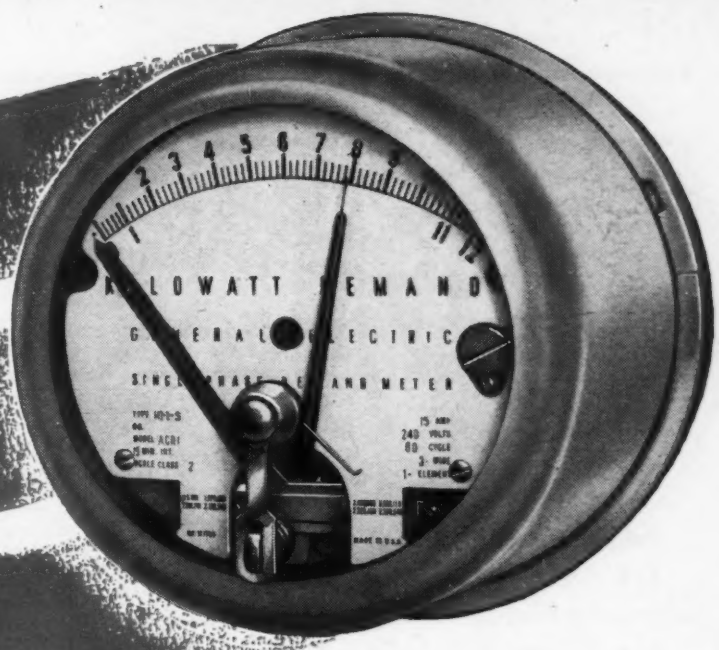


FIG. 3—All four heater cathodes in series along with pair of starters for each tube in arrangement for which patent has been applied

In addition to these units a pair of plug receptacles is provided. One is in parallel with the primary of the transformer and is normally left open; it has proven useful for making tests of the fixture. The other is inserted in the primary circuit of the 6.6/1.45-amp. series isolating transformer and is normally bridged; it has proven useful in locating faults in the cable between successive transformers.

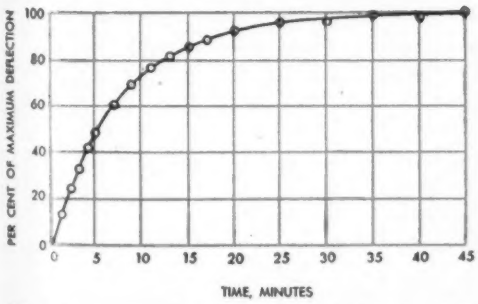
New! THERMAL WATT-DEMAND METER



. . . . . with IDEAL response-time characteristics

- MAXIMUM EFFICIENCY
- INHERENT ACCURACY
- TRUE EXPONENTIAL CURVE
- PREDICTABLE CHARACTERISTICS

NEW G-E THERMAL DEMAND METER FOLLOWS TRUE EXPONENTIAL CURVE



Time of response, Type HI-1 rated 240 volts, 47.7 amperes, 1.0 power factor, 11.4 kilowatts, 25 C

THE FIRST IN A FAMILY OF G-E THERMAL DEMAND METERS

● The new G-E thermal watt-demand meter has ideal response-time characteristics because it is built upon a radically different and unique design, the "direct-heat" principle. Since the current passes directly through the bi-metallic spirals, they serve not only as temperature-sensitive elements, but also as their own electrical-resistance heaters, thus giving maximum heat efficiency.

● The resulting lack of over-shoot — the tendency of the pointer to advance after the current has been removed—and the lack of necessity for compensation assure a meter with initial and sustained accuracy.

● The "direct-heat" principle, moreover, since it is not dependent upon heat transfer, results in operation based on the true law of heating, mathematically expressed in the exponential curve.

● Since the characteristics of the meter can be expressed as a well-known curve, its results are predictable and mathematically definable. Such a meter obviously suggests the possibility of quick calibration and test.

For complete information on this new development in the art of meter design, write today for "Thermal Watt-demand Meters," Bulletin GEA-4541. *Apparatus Department, General Electric Company, Schenectady 5, New York.*

HEADQUARTERS FOR MEASUREMENTS

GENERAL ELECTRIC

Table for Power Factor

G. F. JOHNSON, RATE ENGINEER, NORTHERN

Table is used:

(1) for the ready determination of power factor

(2) to determine corrective capacity to improve power factor

IN many rate schedules containing power factor provisions, the determination of power factor is based upon measurements of the reactive component of the demand or energy. The computation of the power factor from such measured data, involving squaring large numbers, extracting square roots, or reference to trigonometric tables, is usually not relished by billing departments of a utility nor welcomed by auditors of industrial power bills.

For the purpose of simplifying the determination of power factor, the accompanying table was developed. The rate schedule for which the table was specifically prepared defines the average power factor as the quotient obtained by dividing the kilowatt-hours (kw.-hr.) used during the month by the square root of the sum of the squares of the kilowatt-hours used and the lagging reactive kilovolt-ampere-hours (rkvah.) supplied during the same period. Any leading kilovolt-ampere-hours supplied during the period are not considered in determining the average power factor. To make the computations set forth in this definition for each individual customer's billing each month is a laborious and time-consuming process.

RATIO	0	1	2	3	4	5	6	7	8	9
0.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
0.01	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.99	99.98	99.98
0.02	99.98	99.98	99.98	99.97	99.97	99.97	99.97	99.96	99.96	99.96
0.03	99.96	99.95	99.95	99.95	99.94	99.94	99.94	99.93	99.93	99.92
0.04	99.92	99.92	99.91	99.91	99.90	99.90	99.89	99.89	99.88	99.88
0.05	99.88	99.87	99.87	99.86	99.85	99.85	99.84	99.84	99.83	99.83
0.06	99.82	99.81	99.81	99.80	99.80	99.79	99.78	99.78	99.77	99.76
0.07	99.76	99.75	99.74	99.73	99.73	99.72	99.71	99.70	99.70	99.69
0.08	99.68	99.67	99.67	99.66	99.65	99.64	99.63	99.62	99.62	99.61
0.09	99.60	99.59	99.58	99.57	99.56	99.55	99.54	99.53	99.52	99.51
0.10	99.50	99.49	99.48	99.47	99.46	99.45	99.44	99.43	99.42	99.41
0.11	99.40	99.39	99.38	99.37	99.36	99.35	99.33	99.32	99.31	99.30
0.12	99.29	99.28	99.26	99.25	99.24	99.23	99.22	99.20	99.19	99.18
0.13	99.17	99.15	99.14	99.13	99.11	99.10	99.09	99.07	99.06	99.05
0.14	99.03	99.02	99.01	98.99	98.98	98.97	98.95	98.94	98.92	98.91
0.15	98.89	98.88	98.86	98.85	98.83	98.82	98.80	98.79	98.77	98.76
0.16	98.74	98.73	98.71	98.70	98.68	98.67	98.65	98.63	98.62	98.60
0.17	98.59	98.57	98.55	98.54	98.52	98.50	98.49	98.47	98.45	98.44
0.18	98.42	98.40	98.38	98.37	98.35	98.33	98.31	98.30	98.28	98.26
0.19	98.24	98.22	98.21	98.19	98.17	98.15	98.13	98.11	98.10	98.08
0.20	98.06	98.04	98.02	98.00	97.98	97.96	97.94	97.92	97.90	97.88
0.21	97.87	97.85	97.83	97.81	97.79	97.77	97.75	97.73	97.71	97.68
0.22	97.66	97.64	97.62	97.60	97.58	97.56	97.54	97.52	97.50	97.48
0.23	97.46	97.43	97.41	97.39	97.37	97.35	97.33	97.30	97.28	97.26
0.24	97.24	97.22	97.19	97.17	97.15	97.13	97.11	97.08	97.06	97.04
0.25	97.01	96.99	96.97	96.95	96.92	96.90	96.88	96.85	96.83	96.81
0.26	96.78	96.76	96.74	96.71	96.69	96.66	96.64	96.62	96.59	96.57
0.27	96.54	96.52	96.49	96.47	96.45	96.42	96.40	96.37	96.35	96.32
0.28	96.30	96.27	96.25	96.22	96.20	96.17	96.15	96.12	96.09	96.07
0.29	96.04	96.02	95.99	95.97	95.94	95.91	95.89	95.86	95.84	95.81
0.30	95.78	95.76	95.73	95.70	95.68	95.65	95.62	95.60	95.57	95.54
0.31	95.52	95.49	95.46	95.43	95.41	95.38	95.35	95.32	95.30	95.27
0.32	95.24	95.21	95.19	95.16	95.13	95.10	95.07	95.05	95.02	94.99
0.33	94.96	94.93	94.91	94.88	94.85	94.82	94.79	94.76	94.73	94.71
0.34	94.68	94.65	94.62	94.59	94.56	94.53	94.50	94.47	94.44	94.41
0.35	94.39	94.36	94.33	94.30	94.27	94.24	94.21	94.18	94.15	94.12
0.36	94.09	94.06	94.03	94.00	93.97	93.94	93.91	93.88	93.85	93.82
0.37	93.79	93.76	93.73	93.69	93.66	93.63	93.60	93.57	93.54	93.51
0.38	93.48	93.45	93.42	93.39	93.35	93.32	93.29	93.26	93.23	93.20
0.39	93.17	93.13	93.10	93.07	93.04	93.01	92.98	92.94	92.91	92.88
0.40	92.85	92.82	92.78	92.75	92.72	92.69	92.65	92.62	92.59	92.56
0.41	92.53	92.49	92.46	92.43	92.39	92.36	92.33	92.29	92.26	92.23
0.42	92.20	92.17	92.13	92.10	92.07	92.03	92.00	91.97	91.93	91.90
0.43	91.87	91.83	91.80	91.77	91.73	91.70	91.67	91.63	91.60	91.56
0.44	91.53	91.50	91.46	91.43	91.40	91.36	91.33	91.29	91.26	91.23
0.45	91.19	91.16	91.12	91.09	91.06	91.02	90.99	90.95	90.92	90.88
0.46	90.85	90.81	90.78	90.75	90.71	90.68	90.64	90.61	90.57	90.54
0.47	90.50	90.47	90.43	90.40	90.36	90.33	90.29	90.26	90.22	90.19
0.48	90.15	90.12	90.08	90.05	90.01	89.98	89.94	89.91	89.87	89.83
0.49	89.80	89.76	89.73	89.69	89.66	89.62	89.59	89.55	89.52	89.48
0.50	89.44	89.41	89.37	89.34	89.30	89.26	89.23	89.19	89.16	89.12
0.51	89.08	89.05	89.01	88.97	88.94	88.90	88.87	88.83	88.79	88.75
0.52	88.72	88.69	88.65	88.61	88.58	88.54	88.50	88.47	88.43	88.39
0.53	88.36	88.32	88.28	88.25	88.21	88.17	88.14	88.10	88.06	88.03
0.54	87.99	87.95	87.92	87.88	87.84	87.81	87.77	87.73	87.70	87.66
0.55	87.62	87.58	87.55	87.51	87.47	87.44	87.40	87.36	87.32	87.29
0.56	87.25	87.21	87.18	87.14	87.10	87.06	87.03	86.99	86.95	86.92
0.57	86.88	86.84	86.80	86.77	86.73	86.69	86.65	86.62	86.58	86.54
0.58	86.50	86.47	86.43	86.39	86.35	86.32	86.28	86.24	86.20	86.16
0.59	86.13	86.09	86.05	86.01	85.98	85.94	85.90	85.86	85.82	85.79

and Corrective Capacity

STATES POWER CO., MINNEAPOLIS, MINN.

RATIO	0	1	2	3	4	5	6	7	8	9
0.60	85.75	85.71	85.67	85.64	85.60	85.56	85.52	85.48	85.45	85.41
0.61	85.37	85.33	85.29	85.26	85.22	85.18	85.14	85.10	85.07	85.03
0.62	84.99	84.95	84.91	84.88	84.84	84.80	84.76	84.72	84.69	84.65
0.63	84.61	84.57	84.53	84.49	84.46	84.42	84.38	84.34	84.30	84.27
0.64	84.23	84.19	84.15	84.11	84.07	84.04	84.00	83.96	83.92	83.88
0.65	83.84	83.81	83.77	83.73	83.69	83.65	83.61	83.58	83.54	83.50
0.66	83.46	83.42	83.38	83.35	83.31	83.27	83.23	83.19	83.15	83.12
0.67	83.08	83.04	83.00	82.96	82.92	82.88	82.85	82.81	82.77	82.73
0.68	82.69	82.65	82.62	82.58	82.54	82.50	82.46	82.42	82.38	82.35
0.69	82.31	82.27	82.23	82.19	82.15	82.12	82.08	82.04	82.00	81.96
0.70	81.92	81.88	81.85	81.81	81.77	81.73	81.69	81.65	81.62	81.58
0.71	81.54	81.50	81.46	81.42	81.38	81.35	81.31	81.27	81.23	81.19
0.72	81.15	81.11	81.08	81.04	81.00	80.96	80.92	80.88	80.85	80.81
0.73	80.77	80.73	80.69	80.65	80.61	80.58	80.54	80.50	80.46	80.42
0.74	80.38	80.35	80.31	80.27	80.23	80.19	80.15	80.12	80.08	80.04
0.75	80.00	79.96	79.92	79.88	79.85	79.81	79.77	79.73	79.69	79.65
0.76	79.62	79.58	79.54	79.50	79.46	79.42	79.39	79.35	79.31	79.27
0.77	79.23	79.19	79.16	79.12	79.08	79.04	79.00	78.96	78.93	78.89
0.78	78.85	78.81	78.77	78.74	78.70	78.66	78.62	78.58	78.54	78.51
0.79	78.47	78.43	78.39	78.35	78.32	78.28	78.24	78.20	78.16	78.12
0.80	78.09	78.05	78.01	77.97	77.93	77.90	77.86	77.82	77.78	77.74
0.81	77.71	77.67	77.63	77.59	77.55	77.52	77.48	77.44	77.40	77.36
0.82	77.33	77.29	77.25	77.21	77.18	77.14	77.10	77.06	77.02	76.99
0.83	76.95	76.91	76.87	76.83	76.80	76.76	76.72	76.68	76.65	76.61
0.84	76.57	76.53	76.50	76.46	76.42	76.38	76.34	76.31	76.27	76.23
0.85	76.19	76.16	76.12	76.08	76.04	76.01	75.97	75.93	75.89	75.86
0.86	75.82	75.78	75.74	75.71	75.67	75.63	75.59	75.56	75.52	75.48
0.87	75.44	75.41	75.37	75.33	75.29	75.26	75.22	75.18	75.15	75.11
0.88	75.07	75.03	75.00	74.96	74.92	74.89	74.85	74.81	74.77	74.74
0.89	74.70	74.66	74.63	74.59	74.55	74.51	74.48	74.44	74.40	74.37
0.90	74.33	74.29	74.26	74.22	74.18	74.14	74.11	74.07	74.03	74.00
0.91	73.96	73.92	73.89	73.85	73.81	73.78	73.74	73.70	73.67	73.63
0.92	73.59	73.56	73.52	73.48	73.45	73.41	73.37	73.34	73.30	73.26
0.93	73.23	73.19	73.15	73.12	73.08	73.04	73.01	72.97	72.94	72.90
0.94	72.86	72.83	72.79	72.75	72.72	72.68	72.64	72.61	72.57	72.54
0.95	72.50	72.46	72.43	72.39	72.36	72.32	72.28	72.25	72.21	72.17
0.96	72.14	72.10	72.07	72.03	71.99	71.96	71.92	71.89	71.85	71.82
0.97	71.78	71.74	71.71	71.67	71.64	71.60	71.56	71.53	71.49	71.46
0.98	71.42	71.39	71.35	71.31	71.28	71.24	71.21	71.17	71.14	71.10
0.99	71.07	71.03	70.99	70.96	70.92	70.89	70.85	70.82	70.78	70.75
1.00	70.71	70.68	70.64	70.60	70.57	70.53	70.50	70.46	70.43	70.39
1.01	70.36	70.32	70.29	70.25	70.22	70.18	70.15	70.11	70.08	70.04
1.02	70.01	69.97	69.94	69.90	69.87	69.83	69.80	69.76	69.73	69.69
1.03	69.66	69.62	69.59	69.55	69.52	69.48	69.45	69.41	69.38	69.35
1.04	69.31	69.28	69.24	69.21	69.17	69.14	69.10	69.07	69.03	69.00
1.05	68.97	68.93	68.90	68.86	68.83	68.79	68.76	68.72	68.69	68.66
1.06	68.62	68.59	68.55	68.52	68.49	68.45	68.42	68.38	68.35	68.31
1.07	68.28	68.25	68.21	68.18	68.14	68.11	68.08	68.04	68.01	67.97
1.08	67.94	67.91	67.87	67.84	67.81	67.77	67.74	67.70	67.67	67.64
1.09	67.60	67.57	67.54	67.50	67.47	67.43	67.40	67.37	67.33	67.30
1.10	67.27	67.23	67.20	67.17	67.13	67.10	67.07	67.03	67.00	66.97
1.11	66.93	66.90	66.87	66.83	66.80	66.77	66.73	66.70	66.67	66.63
1.12	66.60	66.57	66.54	66.50	66.47	66.44	66.40	66.37	66.34	66.30
1.13	66.27	66.24	66.21	66.17	66.14	66.11	66.07	66.04	66.01	65.98
1.14	65.94	65.91	65.88	65.85	65.81	65.78	65.75	65.72	65.68	65.65
1.15	65.62	65.59	65.55	65.52	65.49	65.46	65.42	65.39	.36	65.33
1.16	65.29	65.26	65.23	65.20	65.16	65.13	65.10	65.07	65.04	65.00
1.17	64.97	64.94	64.91	64.88	64.84	64.81	64.78	64.75	64.72	64.68
1.18	64.65	64.62	64.59	64.56	64.52	64.49	64.46	64.43	64.40	64.37
1.19	64.33	64.30	64.27	64.24	64.21	64.18	64.14	64.11	64.08	64.05

Application—1

The use of the table reduces the procedure to two simple operations without any loss of accuracy within the practical limits required for billing. First, obtain the ratio of the reactive kilovolt-ampere-hours to the kilowatt-hours by dividing the rkvah. by kw.-hr. correct to the third decimal place; and second, find the average power factor corresponding to this ratio by referring to the table.

Example: With readings of 44,000 kw.-hr. and 33,000 rkvah., the ratio of rkvah. to kw.-hr. is 0.750. From the table, the average power factor corresponding to this ratio is found to be 80 percent.

If the data are in terms of kilowatt (kw.) demand and kilovars (rkva.), the power factor can be obtained by using the table in a similar manner.

Application—2

This table can also be used conversely to determine the amount of corrective capacity necessary to improve power factor. The use of the table for this purpose can be demonstrated best by an example.

Example: If it is desired to raise the power factor from 65 percent to 95 percent, the corrective rkva. per kw. required is determined as follows:

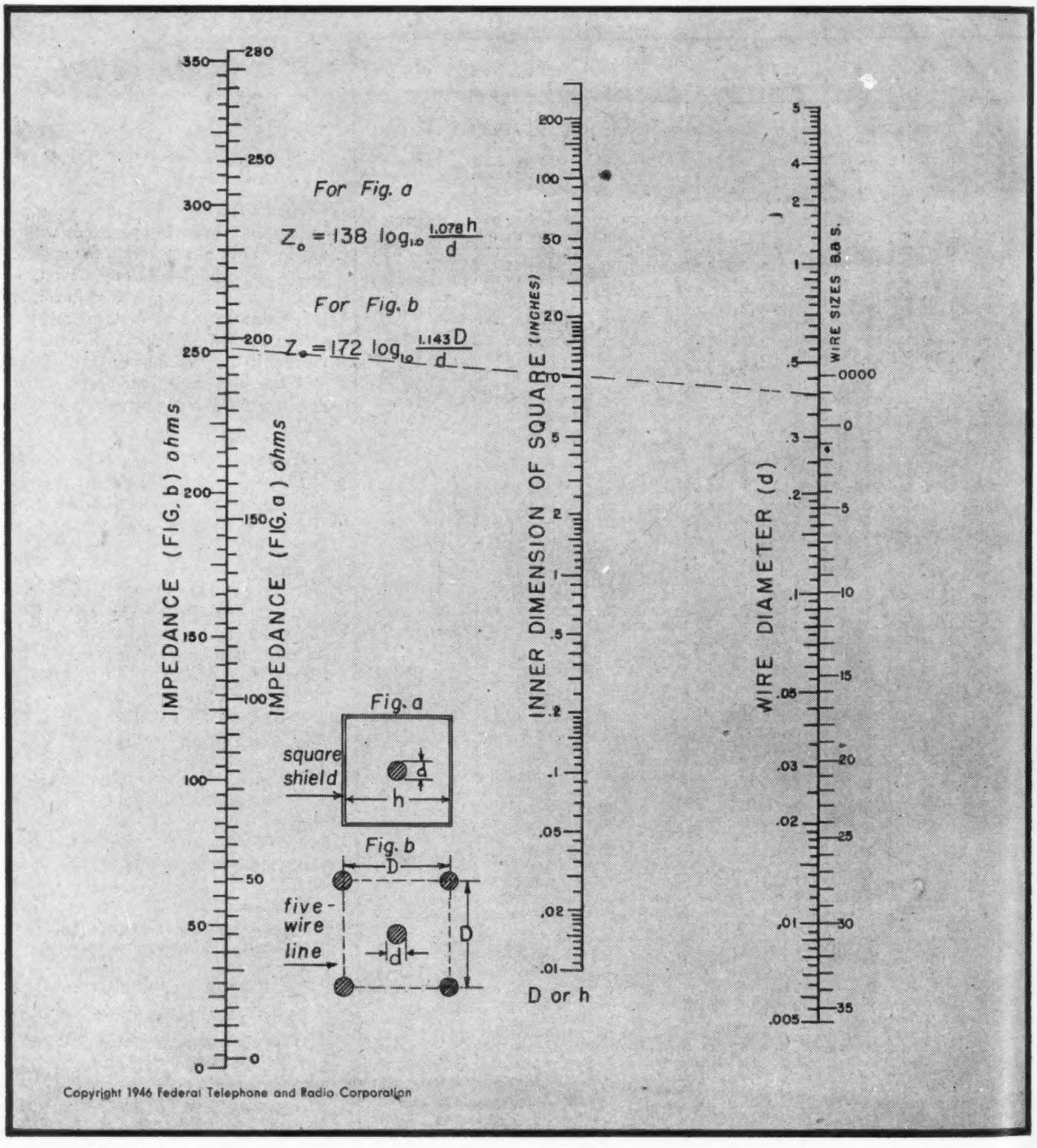
	rkva. per kw.
At 65 percent power factor..	1.169
At 95 percent power factor..	0.329
Corrective rkva. per kw.....	0.840

If the load to be corrected is 40 kw., then 40 x 0.840 or 33.6 rkva. in capacitors would be required.

Characteristic Impedance of Lines*

V—Square Outer Conductor

KARL ZIMMERMANN, Engineer, Intelin Division, Federal Telephone & Radio Corp., New York, N. Y.



IN THIS CHART, a line from d scale through D scale indicates characteristic impedance, Z_o. Any units may be used, unless B&S wire size is used when D must be in inches. Engineering accuracy found when $h/d > 2$ for Fig. a, and $D/d > 3$ in Fig. b. Perfect conductors are assumed, and air, vacuum or gas dielectric (lossless). For solid dielectrics multiply Z_o by $1/\sqrt{\epsilon}$ where ϵ is dielectric constant.

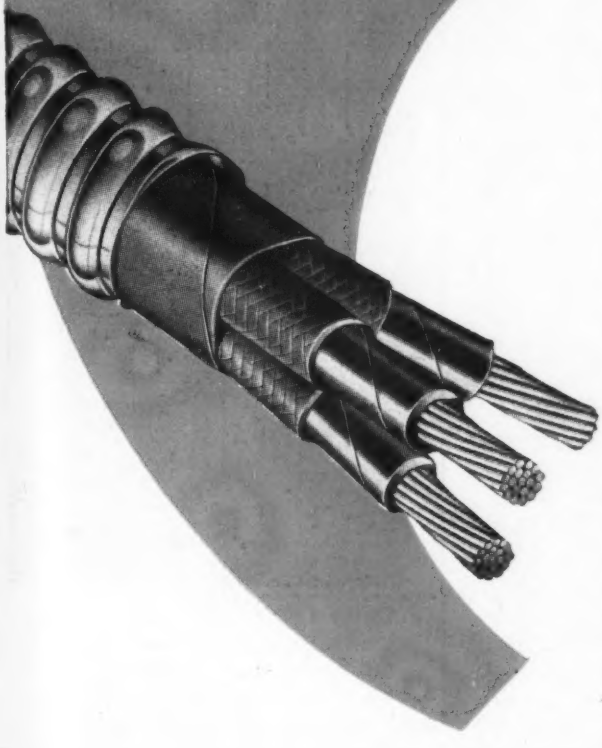
* Concludes series started in ELECTRICAL WORLD, October 26, 1946, p. 92.

"WE SAVED ⅔ OF INSTALLATION COST with G-E INTERLOCKED-ARMOR CABLE,"

says Paul Williamson, Chief Engr., Woolrich Woolen Mills.

Above, two 500-MCM interlocked-armor cables in plant of Woolrich Woolen Mills. These flexible cables make a 90-degree turn at the wall, require only simple supports.

Below, No. 1799 Varnished-cambric interlocked-armor cable (600 volts).



HERE'S what Mr. Williamson says about General Electric No. 1799 Varnished-cambric Interlocked-armor Cable:

"I'd say it takes about a third as many man-hours of work to install G-E interlocked as it does to put in a conduit job. That's because material-handling time is a lot lower, and because interlocked is lighter weight, takes less space, and is flexible and easier to handle.

"I've put in a lot of conduit in my time, and I hope I've installed the last of it. Interlocked has it beat on every count—economies in time, material, and re-use in changed circuits.

"Last summer our crew put in a complete installation of 512 feet in three and one-half hours! What's more, it's a good-looking, neat job, and there to stay."

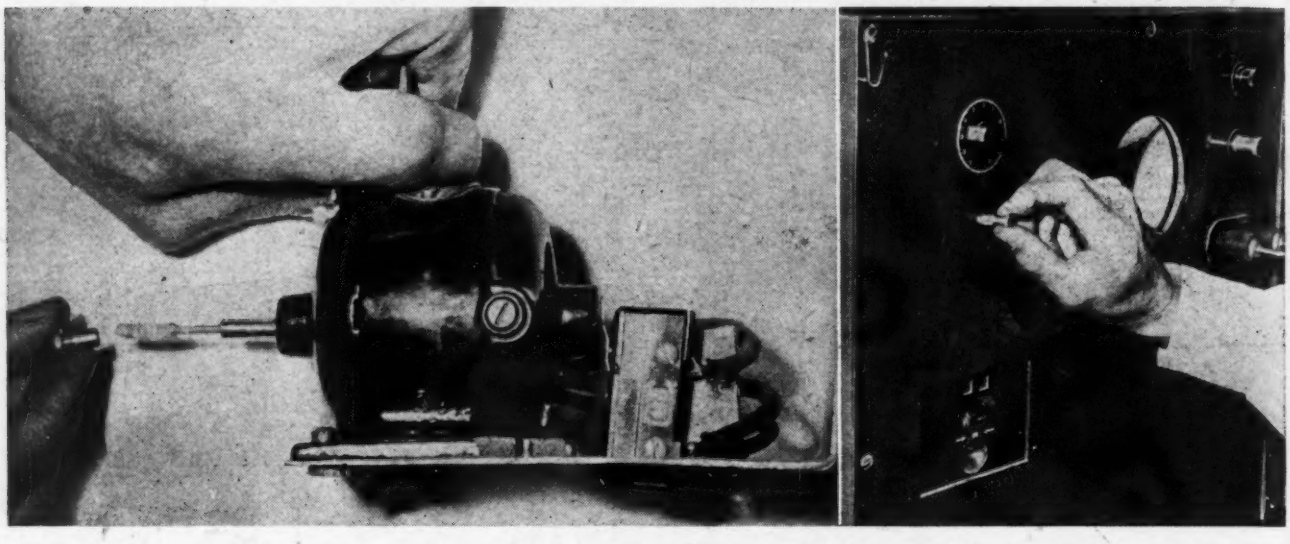
General Electric interlocked-armor cable is used for power-distribution systems at 110 to 15,000 volts in power stations and industrial plants. We believe it gives you the most in ease of handling and in long service life.

You can install it in less time with less materials in less space. For a detailed description of this fine cable and the many means by which its installation can be adapted to existing plant conditions, call your local G-E office or write for Bulletin GEA-4507. *General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

501-34-1200

Jewel Polisher on Meter Board

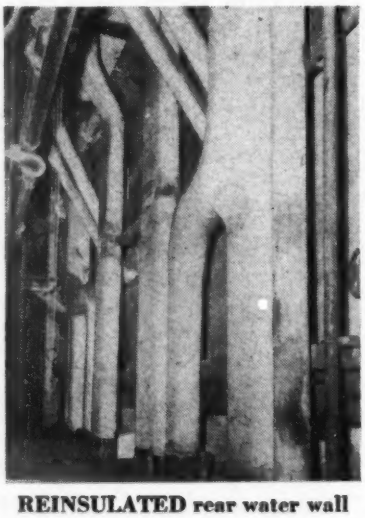


POLISHING METER JEWELS with a small universal motor automatically started by pressing the jewel against the cotton tip shown is one of several handy features incorporated in the meter test board of Coast Counties Gas & Electric Co., Santa Cruz, Calif., by H. D. Noren, meter superintendent. Left view shows motor removed from its mounting while the photograph at right shows the cotton tipped round toothpick projecting through front panel of test board. A micro switch, at right in left view, starts the motor upon end thrust on the polishing tip. On removal of pressure the armature tends to center, which automatically opens the switch

• • •

Mineral Wool Insulates Boiler Water Wall

INDUSTRIAL mineral wool blankets and cement are playing an increasingly important part in protection against heat loss at the South Amboy, N. J., plant of the Jersey Central Power & Light Co. This plant is a high-pressure station using two 25,000-kw. turbines. The high-pressure casings of the turbines, operating at about 750 deg. F., are insulated with the cement form of mineral wool with the usual steel lagging outside.



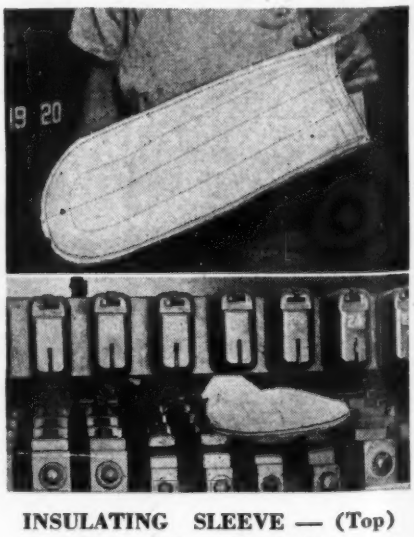
REINSULATED rear water wall of boiler and steam lines

The boilers are Babcock & Wilcox high-pressure, cross-drum type operating at 1,400 lb. The original pressed-block type insulation of the water walls of the boilers has proved friable and breaks away with time and vibration. It is being replaced with mineral wool blankets underneath and cement over the blankets. The entire rear wall of one boiler has been completely renewed in this manner (see illustration); another is in process. Elsewhere, breaks and gaps in yet-unreplaced old block insulation are filled with mineral wool cement troweled on to the necessary depth and shape to cover the break.

Steam lines and valve bodies are also encased in mineral wool cement for conservation of heat.

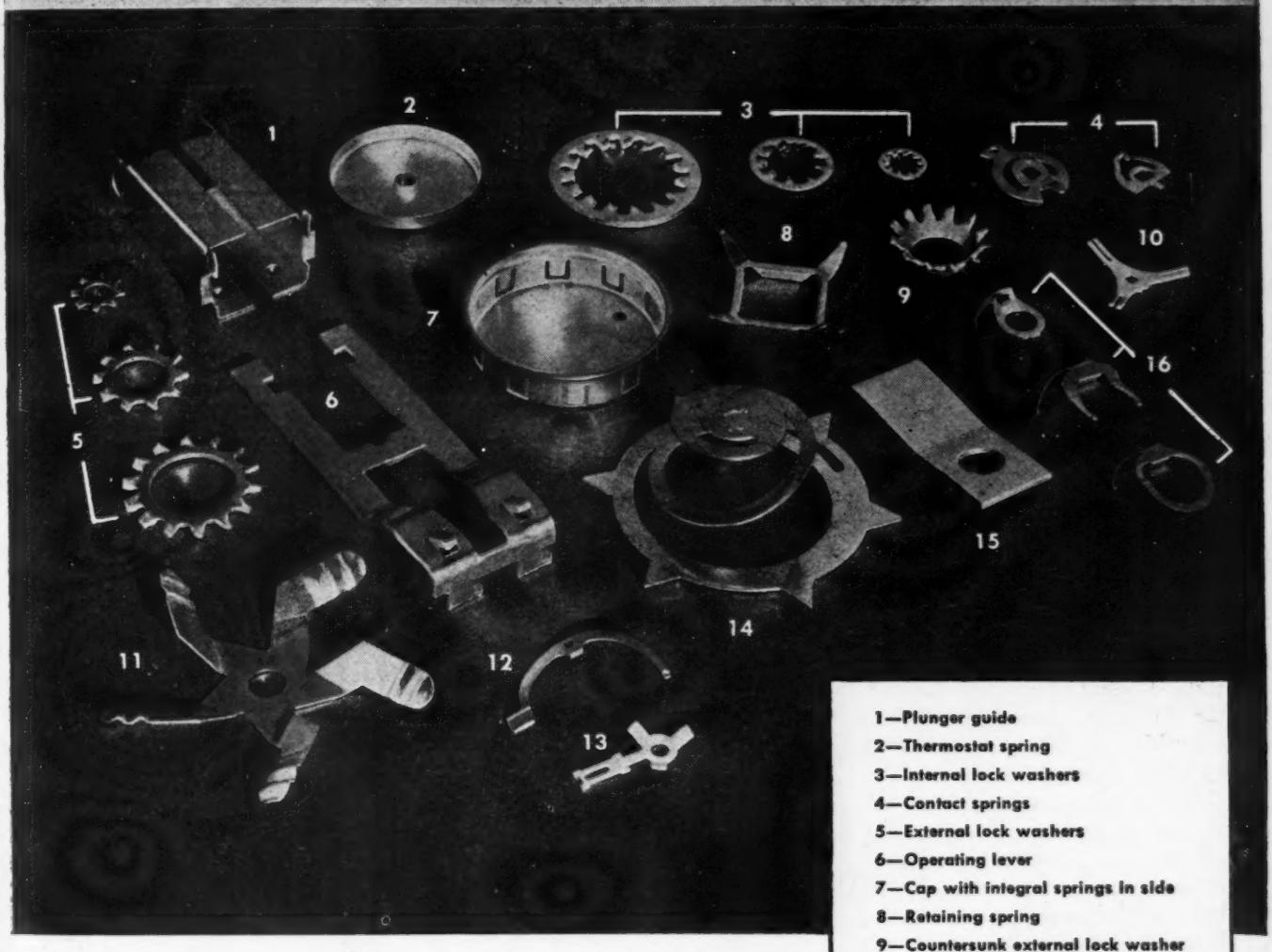
Design Sleeve to Cover Disconnected Feeder Lugs

A SAFETY IMPROVEMENT in the method of isolating disconnected d.c. feeder lugs incorporates the use of a specially designed canvas and rubber sleeve. The idea recently won a suggestion award for Dominick Lee,



INSULATING SLEEVE — (Top) Canvas is used mechanically to reinforce rubber insulation. (Bottom) Sleeve is applied and isolates a disconnected feeder lug on bus selector switch

REVERE PHOSPHOR BRONZES
OFFER MANY ADVANTAGES



1—Plunger guide
2—Thermostat spring
3—Internal lock washers
4—Contact springs
5—External lock washers
6—Operating lever
7—Cap with integral springs in side
8—Retaining spring
9—Countersunk external lock washer
10—Pressure spring for capacitor
11—Five-contact spring
12—Contact spring for radio part
13—Pressure spring and terminal
14—Involute spring
15—Contact point for solenoid
16—Contact springs
—made of Phosphor Bronze strip supplied by Revere

STRENGTH — Resilience — Fatigue Resistance — Corrosion Resistance—Low Coefficient of Friction—Easy Workability—are outstanding advantages of Revere Phosphor Bronzes, now available in several different alloys.

In many cases it is the ability of Phosphor Bronze to resist repeated reversals of stress that is its most valuable property. Hence its wide employment for springs, diaphragms, bellows and similar parts. In addition, its corrosion resistance in combination with high tensile properties render it invaluable in chemical, sewage disposal, refrigeration, mining, electrical and similar applications. In the form of welding rod, Phosphor Bronze has many advantages in the welding of copper, brass, steel, iron and the repair of worn or broken machine parts. Revere suggests you investigate the advantages of Revere Phosphor Bronzes in your plant or product.

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Consolidated Edison Co. of New York, Inc.

It is customary to insulate the lugs from bus selector switches and from accidental contact with nearby lugs during the tracing of feeder lines when the high voltage used might cause an arc. Standard practice called for the disconnected lugs to be insulated with a wrapping of asbestos tape until it was ready to be returned to service. The wrapping with tape was difficult as the feeder lug to be isolated was often separated from live lugs on either side by an air gap of only one or one and a half inches.

With the new safety device, the tedious wrapping is eliminated. A prepared canvas sleeve, designed to fit snugly and insulated with rubber, is merely slipped over the lug. The rubber is thick enough to prevent any flashover, even at the 2,000-volt potential used in feeder tracing. The canvas siding prevents any chance tearing of the insulating material.

The sleeve is 22 in. long and 8 in. wide, holds the feeder lug easily and reaches far enough down the feeder to take in the severed pressure, ammeter and control wires, which formerly had to be taped separately when the lug was isolated.

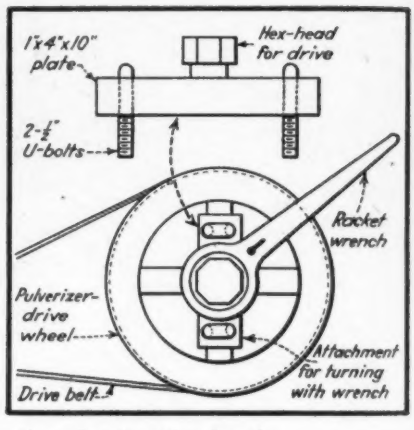
• • •

How to Turn Pulverizer Mill with a Wrench

MICHAEL A. SERAFIN, R. E. Burger Station, The Ohio Public Service Co., Cleveland, Ohio

TURNING a pulverizer mill to any position, by hand, is possible with the device illustrated in the accompanying sketch and picture. A hexagon wrench used for the large top nuts is adapted for this purpose with an attachment for the spokes of the drive wheel.

Previously, it was necessary to use a pry in the classifiers to force the mill to turn, but even this was not enough when the mill was stuck. This method resulted in some damage to the classifiers. One man can do the job with ease with the wrench device.



WRENCH DEVICE permits turning coal pulverizer by hand.

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Curing Corrosion in Boiler Drums

CORROSION within the upper drum of a 100,000-lb. per hour, 600-psi., 770-F. boiler in an eastern non-base load steam plant which has been in operation about four years took place after the boiler had been shut down and allowed to cool. Operating records showed that water was added up to the running level to replace shrinkage in content; but the drums were not filled entirely because it would have been necessary to waste water before starting up if this were done. Sulphite was added to provide an excess of about 50 ppm., but apparently the sulphite in the upper drum was oxidized by air which had been drawn into the space above the water. The appearance of corrosion products was typical of oxygen action.

It was believed that if the station were operated more continuously as a base load plant, this problem would not exist. The need for taking the plant off the line and holding it in readiness for almost immediate service imposes a severe operating condition with regard to corrosion control. It was therefore recommended that whenever such outages occur and the boiler pressure is dropped, the sulphite concentrations should be built up to 100 ppm. and the boilers filled up to the vents. If they remain idle, samples are then tested at least weekly for pH and sulphite. When the pH drops below 11 or the sulphite to less than 50 ppm., the water level is dropped to the bottom of the gage glass and chemicals added to increase the phenolphthalein alkalinity of the water to 100 ppm. (80 ppm. of caustic) and the sulphite to 100 ppm. Drum is then again filled.

One difficulty in operating as above was the absence of any means of knowing the water level after it is out of sight at the upper end of the gage glass. To meet this, a small head tank provided with a gage glass was connected to one of the vent lines on the atmospheric side of the valve. This tank is visible when it is being filled. Both boilers were thus equipped. Before a boiler is taken off the line and while some circulation is still occurring, the necessary caustic and sulphite are added, and if cooling down occurs, water is added until it is visible in the glass of the head tank. The water is of course lowered to the normal operating level of the boiler before starting up steam generation again. While it was realized that this method of operation may result in some loss of water, if desirable some storage facilities can be used to receive the water when the level is dropped.

National Organization

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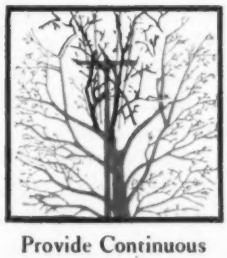
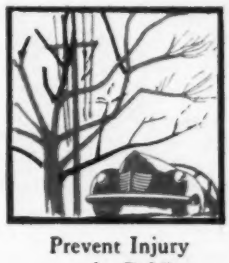
For this the Asplundh tree trimmers thank you. Asplundh also thanks Electrical World for helping us to carry this message to you. As servants of the public through the utility companies, the Asplundh organization provides men, tools and know-how — on the job — wherever trees interfere with wires.



Provide Continuous Service



Prevent Injury to the Public

TREE EXPERT COMPANY

JENKINTOWN • PENNSYLVANIA

EASTERN DIVISION: Binghamton, N. Y. . . Malvern, L. I., N. Y. . . .

Scranton, Pa. . . . Allentown, Pa. . . . Philadelphia, Pa. . . . Plainfield, N. J.

Glenburnie, Md. . . . Silver Spring, Md. . . . Richmond, Va. . . . Charlotte, N. C.

PITTSBURGH DIVISION: Pittsburgh . . . Greensburg, Pa. . . . Erie, Pa.

LOAD BUILDING

Incandescent Down-Lighting Boosts Fluorescent in New Market

SLIMLINE AND INCANDESCENT combine in producing 50 foot-candles with excellent quality in this Denver market

HIGHLIGHTED with 31.5 kw. of incandescent down-lighting combined with Slimline fluorescent has given Miller's supermarket in Denver one of the finest lighting jobs in that area. Even "Dean of Lighting" Ward Harrison commented favorably upon it on a recent visit.

Lighting equipment in the 12,740-sq.ft. market consists of 112 8-ft., two-lamp Slimline units and 105 300-watt, R-40 reflector floods. Interspersed every 8 ft. in the rows of Slimlines are the incandescent floods. The result as shown is a general level of 50 foot-candles, of good color value, with merchandise effectively highlighted by the incandescent floods.

Thirteen kw. of fluorescent (51 watts per lamp) provides 683,200 lumens, and 31.5 kw. of incandescent, 170,100 lumens, to produce these results. Installation was made by Schockett Electric Co., of Denver, with F. Bischofberger, lighting engineer of the Public Service Co. of Colorado, collaborating on design.

•

Utility Departments Cooperate in Developing Kitchen Modernization

BOSTON EDISON'S home service division, after war-time handicaps caused by appliance shortages, is again functioning on a broad scale in load-building activities, with important public relations aspects and expanded interdepartmental cooperation. Recently it has been identified with institutional electric cooking and allied service developments, indicating the usefulness of this branch of a large utility organization in a field beyond the normal home management interests of such a division.

Typical of this enlarged activity is the interdepartmental functioning of the Boston company in providing service to Regis College, Weston, Mass., in connection with the modernization of kitchen facilities in the domestic science courses. The home service division received an inquiry from the head of the college dietetics laboratory as to the possibilities of establishing two kitchen units for students' use in place of an older installation.

Widespread interest in electric home service has been created in the company's territory by radio broadcasts, newspaper advertising, demonstrations, and quiz programs before women's organizations (ELECTRICAL WORLD, March 3, 1945, page 128). The inquiry from Regis was discussed with the new business department, and a survey made at the college, with the result that a complete layout was prepared with the aid of the engineering department for a modernized dietetics laboratory 21 ft. 6 in. long by 14 ft. 6 in. wide by 10 ft. 8 in. high, for submission to college authorities.

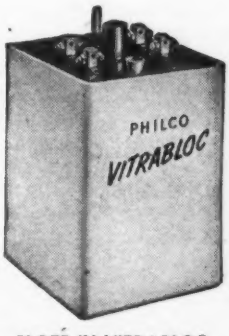
Equipment Plans

This layout, in blueprint form, showed in perspective the proposed location and arrangement of all equipment, with a list of supplementary kitchen appliances planned for on a plug-in basis, the lighting facilities, bill of material, proposed manufacturers, and number of items required. Provision was made for three modern home kitchen units equipped with electric ranges, refrigerators, cabinets, sinks, and in addition general facilities including a disposall, electric clock, automatic dishwasher, deep-freeze outfit, shelves, etc. The Edison company also made up a wiring plan for the job, and suggested the desirable standards of illumination (65 foot-candles obtained by installation of a 160-watt fluorescent fixture over-

More Power for More Lines!

Expanded utility service, long retarded by the war, calls for substantially increased battery capacity for control and auxiliary power. In providing this specialized equipment, Philco Storage Battery engineers stand ready to serve you at every stage of planning, engineering and installation. Only Philco offers you control batteries specifically designed for modern full float service—the famous Philco Floté Batteries that eliminate low cells and materially reduce operating costs. Only Philco Floté Batteries are available in all types of glass, rubber and Vitrabloc jars. Write for latest specification data. Specify Philco. PHILCO CORPORATION, Storage Battery Division, Trenton 7, New Jersey.

LOTÉ IN GLASS

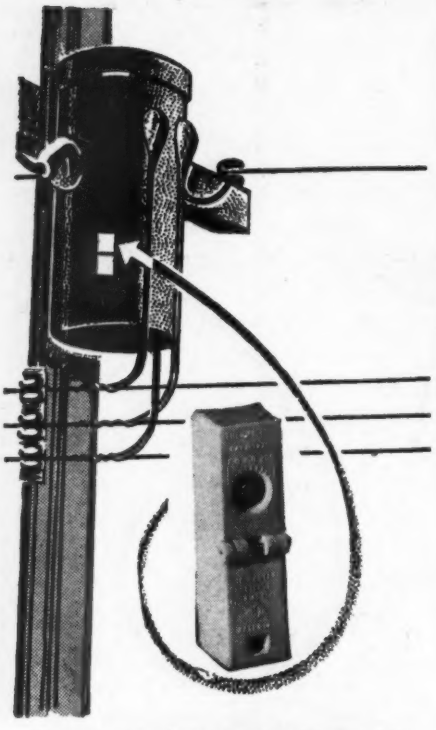


FLOTÉ IN VITRABLOC

FLOTÉ IN RUBBER

PHILCO

FOR 50 YEARS A LEADER IN STORAGE BATTERY DEVELOPMENT



ACCEPTED!

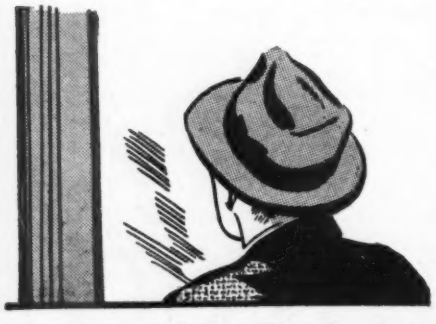
THERMALARM

SHOWS EXACT LOAD CONDITION OF TRANSFORMER!

THERMALARM is a simple positive means of determining whether your transformers have exceeded their safe operating temperature limit . . . and utilities are widely accepting them since announced available two months ago!

THERMALARM is a small device that automatically trips a red flag when the temperature is too high, and cruising inspectors can easily see the flag and investigate. If the red flag shows, there's danger . . . and they investigate!

THERMALARM is most valuable to your distribution system! Cost only $3 each! Order as many as you need today. Write at once!



EASTERN SPECIALTY CO.

3617 N. 9th St., Philadelphia 40, Pa.

head and a 2-tube auxiliary unit).

Decor was designed with a white ceiling, sauterne cornice, and a potter's clay soffit over cabinets, with a floor covering of 9-in. square tiling, of mottled terra cotta with 11-in. black border. Receptacles and switches are of ivory with chrome plates.

The home service division participated in this work with cooperative interest in the efficiency of the detailed kitchen layouts, and the unit kitchens used by the students reflect the experience of this division as well as that of the new business department in general, in making available the latest labor-saving ideas in the home kitchen for the benefit of this institutional work. As the graduates enter employment or have homes of their own, it is believed that their familiarity with these modern methods and equipment will be an influence for their use in years to come.

•

New Industry Campaign Produces Concrete Results

DURING the first eight months of this year, 192 new manufacturing plants have located in the city of Los Angeles. Many moved west as part of the plant decentralization trend, others because of markets, but many came because they had become *sold* on southern California by a vigorous advertising and follow-up campaign put on by the Los Angeles Department of Water and Power.

Advertising Campaign

Armed with facts about the advantages of Los Angeles, the Department contacted an advertising agency, Buchanan & Co. An appropriation of $20,000 was made for the first campaign, beginning November, 1945, which ran in the following general business and trade publications: *Chemical and Metallurgical Engineering, Central Manufacturing District Magazine, Food Industries, Manufacturers' News, Manufacturers' Record, Modern Industry* and *Wall Street Journal.* In April, 1946, *Business Week, Forbes* and *United States News* were added to the schedule.

This first campaign proved so successful that an appropriation of $80,000, four times larger than the original one, was made for 1946-1947 advertising. The publication schedule was expanded and as of July, 1946, the following magazines were included: *Banking, Business Week, Chicago Journal of Commerce, Duns' Review, Forbes, Fortune, Modern Industry, Nation's Business, Sales Management, United States News* and *Wall Street Journal.*

National advertising, however, has not done the most important part of the selling job. The Department of Water and Power gives major credit to a brochure issued to coupon-answerers, detailing Los Angeles' advantages in the kind of detail it would be impossible to give in a short magazine space.

Tell City's Advantages

This brochure, entitled "F.O.B. Los Angeles," tells every fact of the city's advantages in complete detail and, in addition, it lists specific utility services rendered to new and old industries by the city-owned system. These services include aid to manufacturers in locating needed machine tools, machine tool time, or subcontractors; in finding factory sites with suitable water and power facilities; special custom-tailored studies by industrial engineers of the Department on diverse subjects such as raw material sources, transportation facilities, etc. Included also are an advisory service to help in operation of all kinds of power machinery; a survey service on electrical subjects, such as circuit loading; manufacturing process studies; furnishing recommended wiring layouts; all kinds of electrical studies on rates, efficiency, etc.; reports on heat application in food processing; coordinated information on kitchen equipment for industrial cafeterias; lighting engineering advice, and other services.

Campaign Results

Requests for the "F.O.B. Los Angeles" brochure have poured in at a gratifying rate. Between the time of its issue May 1, 1946, and October 1, 1946, 1,680 requests were received. "The campaign has produced solid results," states Samuel B. Morris, general manager of the Department of Water and Power. "By solid results, we mean actually getting new industries located here. The 192 represent in excess of 10,208 hp. or about 45 percent of our new power load gained during the first eight months of 1946. This is the kind of results that sold us on not only con-

L-M AERIAL CABLE HARDWARE

is Designed to Give...

Greater SUPPORT — *Better* PROTECTION — *Utmost* CONVENIENCE

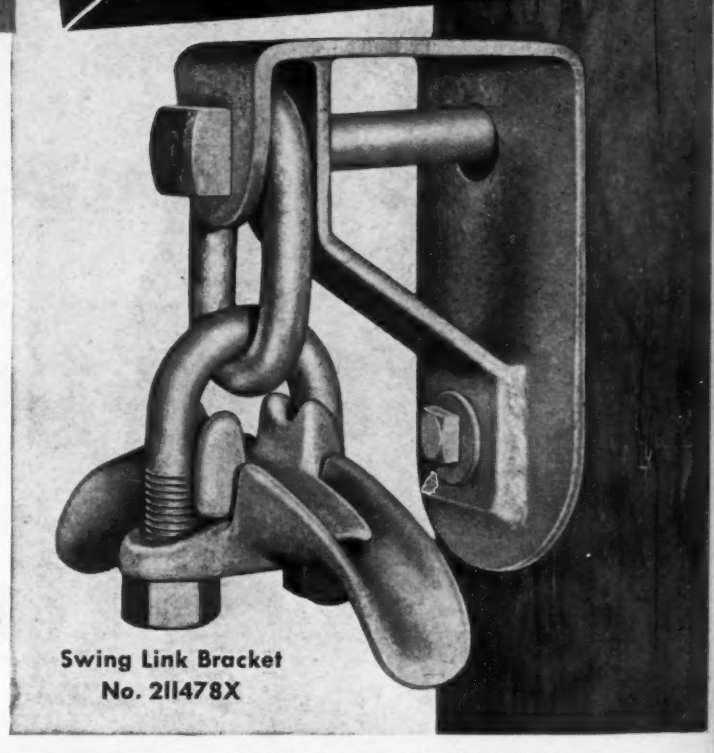
The efficiency and "life expectancy" of aerial cable is greatly increased when the strand is supported and protected by properly designed aerial cable hardware. L-M engineers accepted this fact as a challenge and spent many months studying the best methods of stringing and hanging aerial cable. They have developed a wide variety of design-right fittings, carefully constructed to meet the most rigid requirements.

Each of the clamps shown here is constructed of tough, durable steel, hot-dip galvanized, and designed to insure adequate support . . . to grip the cable firmly without injury to strand . . . and to provide utmost convenience in use.

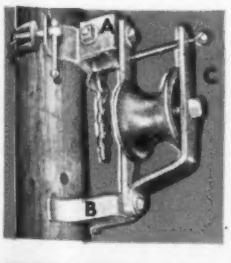
Complete details on these and other pole line hardware items will be sent you on request. Write Line Material Company, Aerial Cable Hardware Division, East Stroudsburg, Pennsylvania, or Milwaukee 1, Wisconsin.

Swing Link Bracket—No. 211478X

This bracket was especially designed to permit its use with many types of suspension clamps. (Shown here with No. 906 Suspension Clamp.) Large pole bearing surface affords wide range of versatility; a very flexible pole support. It may be used on angles up to thirty degrees.

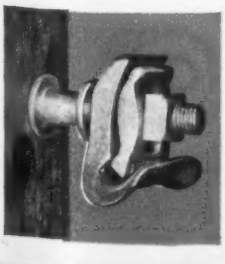


Swing Link Bracket
No. 211478X



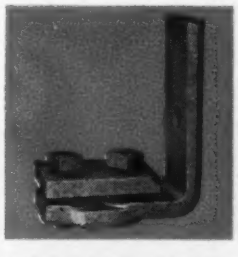
Cable Stringing Pulley, No. 285979X, swinging type

(A) Upper yoke with chain clamp for easy attachment to pole; (B) Lower yoke, pole support only; (C) Pulley, which may be used alone when bolted to pole. When cable is pulled on an angle, lower yoke swings out from pole to maintain maximum surface between pulley and cable. Lower yoke may be removed entirely to allow slight back angle.



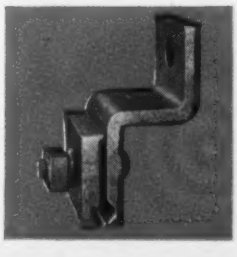
Neutral Wire Clamp, No. 223185X

Finest clamp of its kind where 500 to 1000 lbs. "in line" holding power is sufficient. Narrow enough to fit between winding tape. Lip supports messenger before tightening. Forged steel, hot-dip galvanized. Extension bolt, available in various lengths, with washer, square nut and Palnut, keeps clamp 1⅝" from pole.



Messenger Hanger, No. 223179X, for pole or wall mounting

Greatest "in line" holding power (up to 2500 lbs.) of all L-M suspension fittings. Slotted groove clamps stranded messenger ¼" to ½" diameter, preventing side slip; rounded edges prevent damage to strand. Mounted to pole or wall with ½" lag screw and ⅝" through-bolt. Curved wire grooves permit use on curves or slight angles as well as straight runs.



Extension Clamp, No. 223186X, for pole or wall mounting

One of many L-M clamps that permits installation of cable without cutting copper braid. Curved groove for messenger withstands vertical pull of more than 8,000 lbs. exceeding strength of messenger. Flared edges permit angle pull without danger of injury to strand. Body and clamp ⅜" pressed steel; ½" track bolt.

LINE MATERIAL
POLE LINE HARDWARE

L-M DISTRIBUTION EQUIPMENT INCLUDES: Distribution Transformers • Fuse Cutouts and Fuse Links • Lightning Arresters • Oil Switches • Pole Line Hardware • Line Construction Specialties • Underground Equipment • Fibre Conduit • Street and Airport Lighting Equipment • Wired Radio Control Equipment • Capacitors

small in size . . .

LIGHT in weight . . .

LOW in cost . . .

*T. M. Reg. U. S. Pat. Off.

The MIDGET "MEGGER"* INSULATION TESTER

• Smallest of all the "Megger" insulation testing instruments—the Midget "Megger" Tester is used and approved by maintainers, railway electrical and signal engineers, as well as by industrial contractors, maintenance men and inspectors.

It is ideal for detecting and diagnosing trouble in signal, power and control circuits, train lighting, air conditioning, and refrigerating equipment.

Weighing but three pounds and being small enough to fit into pocket or tool kit, the Midget "Megger" tester reads up to 50 megohms and delivers 500 volts DC from a self-contained, hand-cranked generator—a small investment that pays big dividends by keeping maintenance costs low.

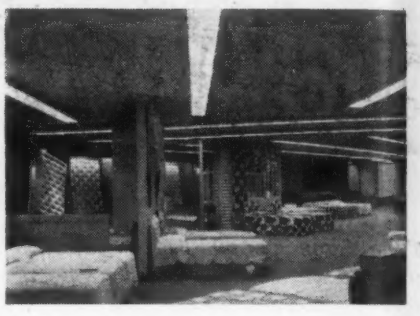
For complete descriptions, applications, other ranges available and prices, write for Bulletin 1785-W.

James G. BIDDLE CO.
ELECTRICAL & SCIENTIFIC INSTRUMENTS
1316 ARCH STREET • PHILADELPHIA 7, PENNA.

tinuing, but expanding, the Department's national advertising campaign to attract new industries to Los Angeles."

•

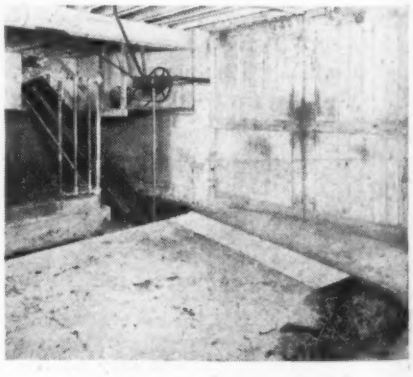
Shallow Fixture For Low Ceiling



FIXTURES only 3 in. deep solved the problem of lighting this low-ceiling area under a balcony in the Simmons Bed Co. showroom, New York. It was impractical to recess the lighting in the ceiling. The shallow, louvered fixtures, made by the Frink Corp., each contain two 40-watt F lamps, are set in continuous rows on 10-ft. centers, and provide uniform illumination of 35 foot-candles

•

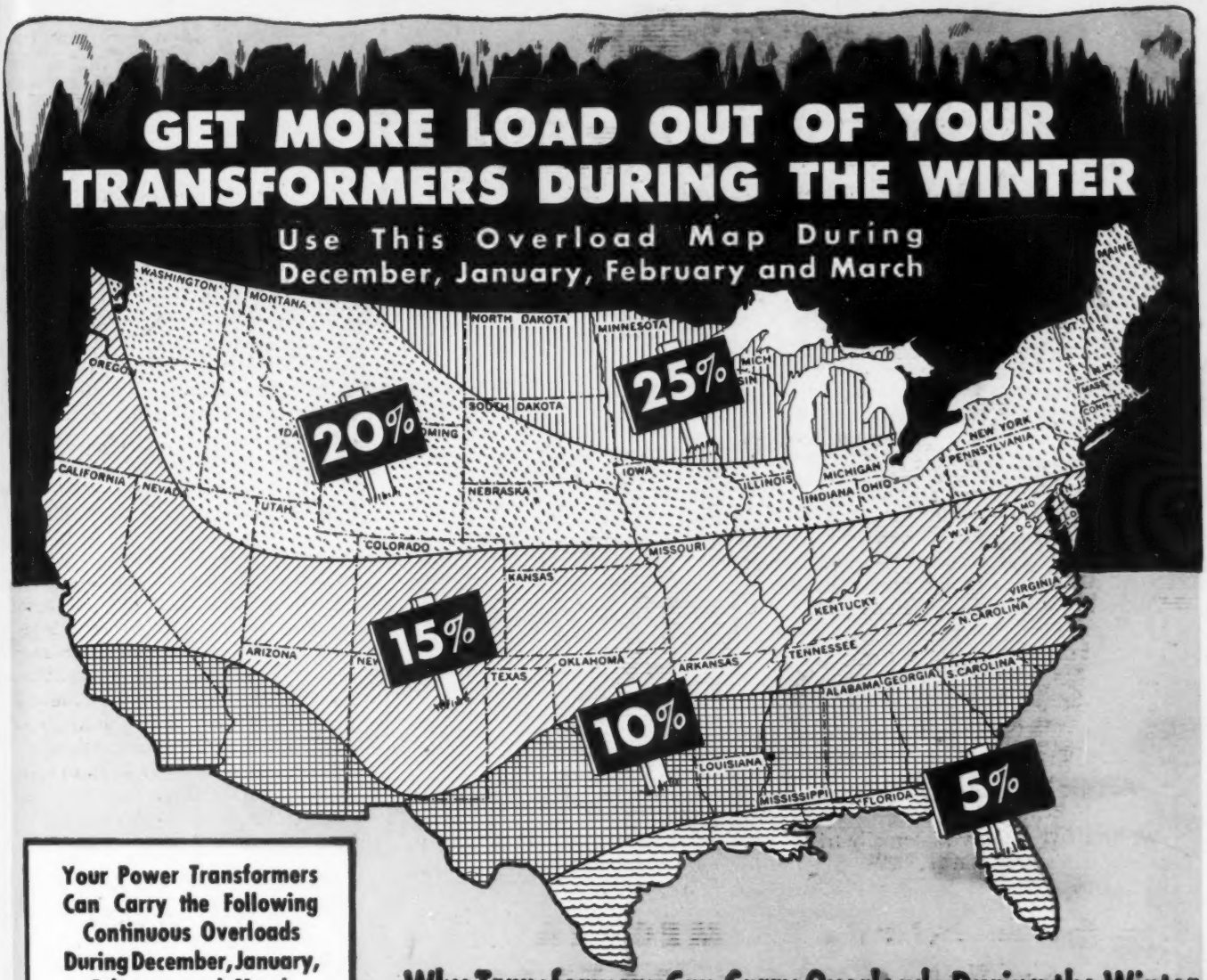
Cleans Barn in Ten Minutes



THIS 30-COW barn on the H. H. Riese farm near Brooklyn, Wis., is cleaned automatically in ten minutes' time. Paddles attached to an endless chain in the gutter discharge the litter into the conveyor, visible in the background, that elevates and discharges it into a manure spreader outside the barn. The motor and gear box driving the endless chain in the gutter are to be seen in the middle of the illustration. The motor drive for the conveyor is located at the discharge end. The Riese farm is on the lines of the Wisconsin Power & Light Co., Madison

GET MORE LOAD OUT OF YOUR TRANSFORMERS DURING THE WINTER

Use This Overload Map During December, January, February and March



Your Power Transformers Can Carry the Following Continuous Overloads During December, January, February and March

Temperature Zone	Permissible Continuous Overloads
	25%
	20%
	15%
	10%
	5%

The above data applies to all Pennsylvania Oil and Askarel self-cooled transformers—55° C Rise.

For Transformers with Forced Air Cooling

Apply ¾ of the above percentages to the forced-air cooled rating.

Why Transformers Can Carry Overloads During the Winter

● Due to low ambient temperatures during the winter, transformers can carry more load than their nameplate rating. The transformer standards of the American Standards Association recommend that the continuous KVA loading for oil-immersed, self-cooled transformers may be increased one per cent for each degree that the daily average temperature is below 30° Centigrade.

Based on records of the U. S. Weather Bureau over a period of years, equivalent ambient temperatures were calculated for the 4 month winter period for representative locations throughout the country.

The equivalent ambient is the temperature which, if maintained constantly, would result in the same aging as that occurring under the actual ambient temperatures throughout the period. The equivalent ambient temperatures were used to calculate the permissible continuous overload capability for various temperature zones.

The continuous overloads indicated by the map and table may be safely carried during the 4 winter months because the operation of a transformer at low temperatures results in a slower aging of insulation which compensates for faster aging of insulation during operation at higher temperatures.

Pennsylvania TRANSFORMERS

Pennsylvania TRANSFORMER COMPANY

PITTSBURGH, PENNSYLVANIA

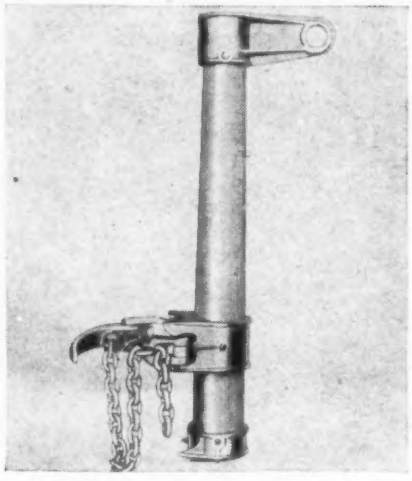
Reprints of This Page are Available Upon Request

NEW EQUIPMENT

Transformer Gin Mountable On Wood, Steel Poles

A NEW TRANSFORMER GIN for hoisting small distribution transformers, circuit breakers and reclosers, for pole mounting, was recently developed by the A. B. Chance Co., Centralia, Mo.

This gin may be mounted on wood or steel poles and is held securely by a specially designed chain tightener which is locked in place with a safety latch. The hard wood mast is laminated to give exceptional strength. The heat-treated aluminum castings make this lightweight tool easily handled. The gin is rated to lift 1,500 lb. maximum load.



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Cold Cathode Relay Tube Reduces Firing Delay

A NEW FIVE-ELEMENT, internally triggered, miniature cold cathode relay tube, type OA5, has been announced by the electronics division, Sylvania Electric Products Inc., 500 Fifth Ave., New York 18, N. Y. Measuring 1⅝ in. over-all and ½ in. in diameter, the tube reduces delay in firing from 100 to 1 microsecond; has stable triggering characteristics throughout life; and is designed for positive-pulse, low-current triggering on trigger grid.

These improved characteristics are reported to make it suitable for electronic photoflash and similar applications where manual trip, built-in shutter synchronizing, or photocell switching is used. Used in photocell controlled equipments, the tube permits simultaneous control of any number of flash units without interconnecting cables. Unusually low trigger currents eliminate shock hazard and switch contact arcing.

Typical operating characteristics of the tube are: anode, volts 750; trigger grid bias, volts +90; trigger grid resistance, megohms 0.25; discharge condenser, mfd. 0.25; keep-alive current, microamperes 50; trigger pulse, volts 85; and ambient temperature from −40 to +60 deg. C.

The tube may be mounted in any position and is supplied with miniature button seven-pin base.

•

Unit Responds to Impulses Spaced 1/10 Microseconds

A NEW decade-scaling unit, developed by General Electric Co., Syracuse, N. Y., and intended primarily for laboratory use in connection with particle detectors, will respond to electrical impulses separated by time intervals as small as one ten-millionth of a second.

The new unit (Type YYZ-1) is for scaling random or periodic pulses from one or more sources, by either a factor of 10 or 100, indicating on an instrument the number of pulses received and delivering an output pulse for every 10 or 100 input impulses. Feature of the new instrument is its low resolution time, one-tenth of a microsecond.

In addition to its use with particle detectors, it may also be used for accurate counting of extremely rapidly recurring phenomena, like the number of cycles in a high-frequency wave, for timing and other purposes, and in conjunction with high-speed calculating machines. Two or more units can be operated in cascade to provide scaling factors of 1,000, 10,000 or more.

Reel Takes Up, Pays Out Electric Appliance Cord

A REEL to take up and pay out electric cord which fits into the base of floor lamps, table lamps, telephones and all household appliances including washing machines, ironers, radios, etc., has been announced by the Benjamin Reel Co., 1557 East 27th St., Cleveland. A reel will also be available which is attached to the plug in the wall and can be used in connection with electrical appliances such as toasters, waffle irons, percolators, etc., eliminating the need for an electric cord on the appliance. Another type reel is to be produced which will be built into the walls of homes at the time of construction.

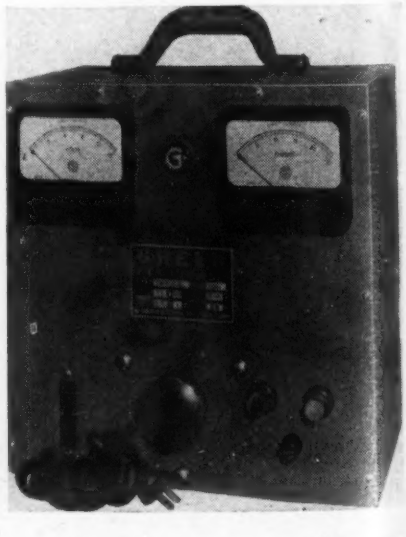
The reel, holding up to 15 ft. of cord, is actuated by a spring.

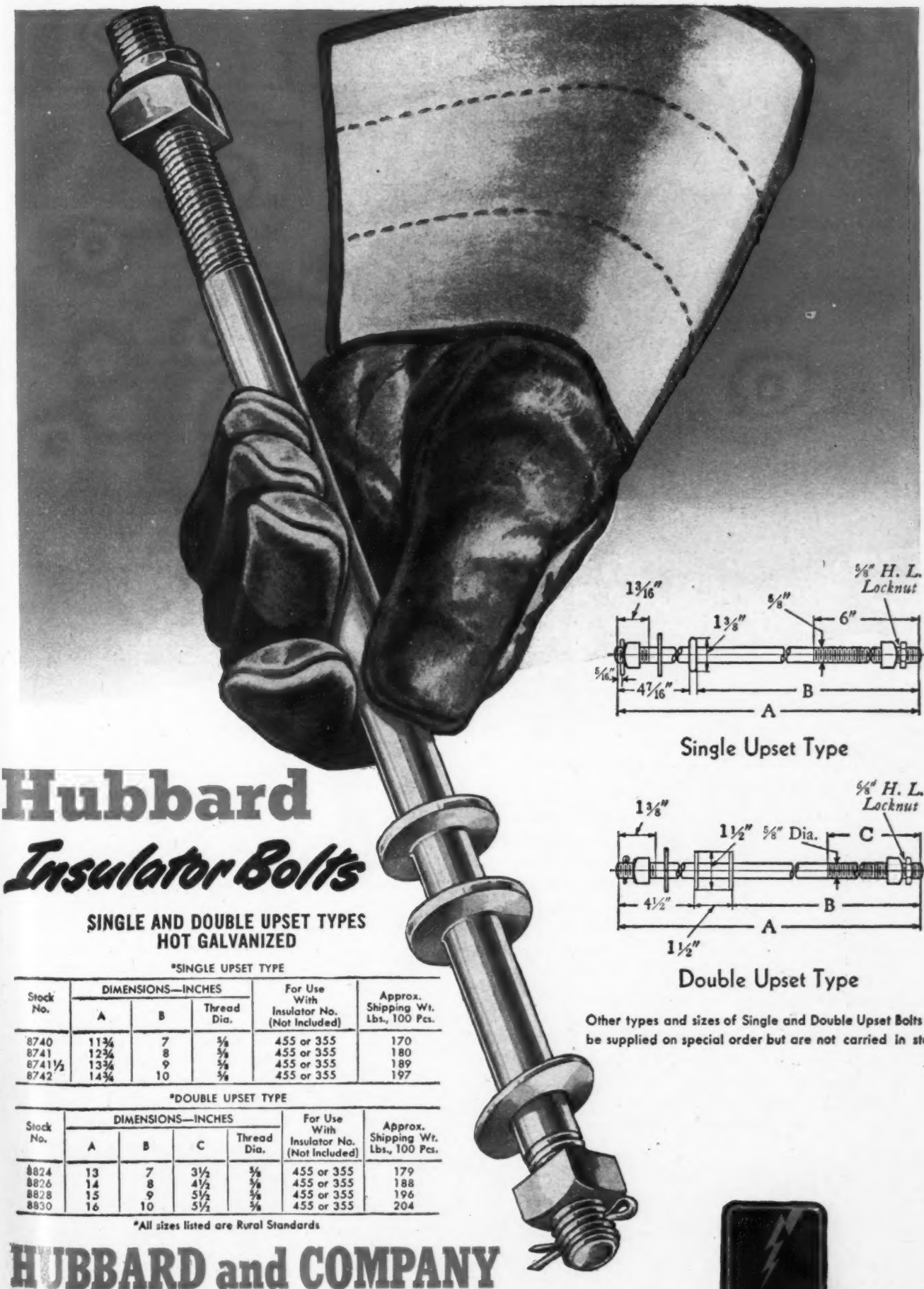
•

Portable Bench Rectifier Has Output 0 to 6 Volts

A NEW PORTABLE rectifier unit with an output adjustable from 0 to 6 volts and with a continuous capacity of 25 amp. has been announced by the W. Green Electric Co., Inc., 130 Cedar St., New York, N. Y. It is a single-phase, full-wave rectifying unit and is convection cooled.

An on-off switch of the magnetic circuit-breaker type is incorporated for input protection. A panel-mounted fuse in the d.c. circuit provides output protection. The unit has a pilot lamp with





Hubbard
Insulator Bolts

SINGLE AND DOUBLE UPSET TYPES
HOT GALVANIZED

*SINGLE UPSET TYPE

Stock No.	DIMENSIONS—INCHES A	B	Thread Dia.	For Use With Insulator No. (Not Included)	Approx. Shipping Wt. Lbs., 100 Pcs.
8740	11¾	7	⅝	455 or 355	170
8741	12¾	8	⅝	455 or 355	180
8741½	13¾	9	⅝	455 or 355	189
8742	14¾	10	⅝	455 or 355	197

*DOUBLE UPSET TYPE

Stock No.	DIMENSIONS—INCHES A	B	C	Thread Dia.	For Use With Insulator No. (Not Included)	Approx. Shipping Wt. Lbs., 100 Pcs.
8824	13	7	3½	⅝	455 or 355	179
8826	14	8	4½	⅝	455 or 355	188
8828	15	9	5½	⅝	455 or 355	196
8830	16	10	5½	⅝	455 or 355	204

*All sizes listed are Rural Standards

Single Upset Type

Double Upset Type

Other types and sizes of Single and Double Upset Bolts can be supplied on special order but are not carried in stock.

HUBBARD and COMPANY
PITTSBURGH • CHICAGO • OAKLAND, CAL.

A Windjammer *Goes Modern*

WITH DIESELS AND BRONZE BOLTS

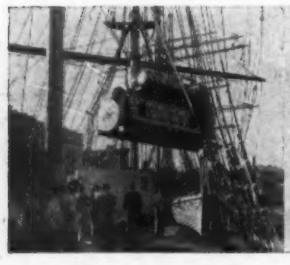
WHEN the glorious old sailing vessel "Foz Do Douro" recently made a record crossing from Lisbon to Vera Cruz, she did it with twin 650 hp. Fairbanks-Morse Marine Diesels in her new engine room . . . at the mercy of the wind no longer.

Her FM diesels, too, were protected against rust and corrosion the *modern way*—by Harper Bronze Bolts . . . long-lasting and easily removable . . . in clutches and circulating pumps.

This study in contrasts between the old and the new may be a cue to a similar application in your industry. Wherever there is danger of rust or corrosion consult a Harper engineer. The original installation of non-rusting, non-corroding fastenings pays for itself many times in reduced maintenance and elimination of breakdown.

THE H. M. HARPER COMPANY
2611 Fletcher Street, Chicago 18, Illinois
Branch Offices: New York City, Philadelphia, Los Angeles, Milwaukee, Cincinnati, Dallas.
Representatives in principal cities

BRASS
BRONZE
COPPER
STAINLESS
MONEL



One of the twin 650Hp. Fairbanks-Morse Marine Diesels . . . equipped with Harper Bronze Bolts . . . goes into the new engine room of the 54 year old sailing vessel.

HARPER
Everlasting Fastenings
Chicago

a removable jewel for lamp replacement, and a continuous range voltage control transformer from zero to maximum. A voltmeter, with an accuracy rating of 2 percent full scale, is connected across the output terminals and a matching ammeter indicates output current. Output terminals are color coated to facilitate connections.

•

Small Synchronous Motor For Instruments, Controls

A NEW SMALL but powerful, self-starting synchronous motor for application in instrument and control fields has been developed by the R. W. Cramer Co., Centerbrook, Conn. The motor, called model SX, is 2⅜ x 2⅛ x 1½ in. in size, develops 30 in.-lb. at 1 rpm., and has an input of 2.7 watts at 115 or 230 volts, 60 cycles.

It has an average heat rise of 30 deg. C., and a rotor speed of 240 rpm. at 60 cycles. Twenty-eight standard gear trains, ranging in speeds from 60 rpm. to one revolution in 24 hours, give the unit wide application. The gear trains are interchangeable.

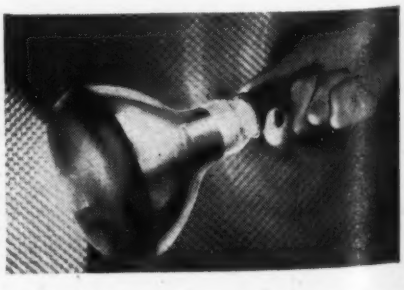
Lubricant is sealed within the housing containing the rotor gear train. Coils are removable, facilitating changes in voltage rating or in field servicing. The unit is primarily intended for applications which require a constant speed at a given frequency. It is currently available for application on 60 cycles and will be later for use on 25 and 50 cycles.

•

Self-Reflecting Heat Lamp Lens Reduces Glare

DEVELOPMENT of a new 250-watt self-reflecting infrared heat lamp, with a bulb of hard glass to provide safety, and with a ruby-hued filter to reduce brightness and to provide greater eye comfort, has been announced by General Electric Co., Nela Park, Cleveland, Ohio.

The new lamp's ruby "lens" filters out harsh glare. Its silvery built-in reflector projects the heat rays generated in the same manner that a spotlight concentrates visible radiations. The single, self-contained, hermetically sealed lamp fits right into ordinary household light sockets.



NEWS ABOUT PEOPLE

Edlund Made Staten Island Official; Penelec Changes

Announcement of changes in duties for two Pennsylvania Electric Co. officers and the resignation of a third has been made. C. H. Edlund, comptroller, has resigned to become vice-president and director of the Staten Island Edison Corp., Staten Island, N. Y. P. R. Lawson, treasurer, was elected comptroller to succeed Mr. Edlund, and R. F. Pruner, secretary, was elected to the newly combined office of secretary-treasurer.

Mr. Edlund has been associated with utility operations for 29 years. He was first employed as office boy at the Brockton Edison Co., and until 1928, worked in an accounting capacity for numerous electric gas and transportation companies under Stone & Webster management. From 1928 to 1935 he was employed by electric utility holding companies in New York City. Mr. Edlund joined the Associated Gas & Electric System in 1935 with headquarters in New York, and in 1944 was elected comptroller of Penelec with headquarters in Johnstown.

C. H. EDLUND

Mr. Lawson became affiliated with the Associated Gas & Electric System at Ithaca, N. Y., in 1925. Two years later, transferring to New York, he did accounting and financial work for the system until 1944. His last position with this organization was as treasurer of the Associated Electric Co. Mr. Pruner joined Penelec in 1927, was named general auditor in 1930 and was elected secretary in 1937.

•

Foster Directs Production for Foster Wheeler Corp.

Pell W. Foster, Jr., vice-president and director of the Foster Wheeler Corp., New York, has been appointed vice-president in charge of production.

P. W. FOSTER, JR.

Mr. Foster has been associated with the company for 27 years, was elected a vice-president in 1942 and a member of the board of directors in 1938.

•

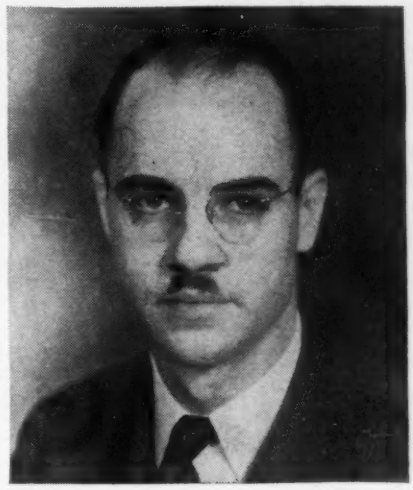
▶ P. W. BARNES, vice-president of the New York Board of Fire Underwriters, has been elected chairman of the committee on electricity and a member of the board of directors.

▶ THOMAS W. MARTIN, president of Alabama Power Co., has been named "The South's Man of the Year" by the Atlanta-published magazine, *Dixie Business*. Mr. Martin was selected from more than a score of Southerners for the top honor. He is father of the Southern Research Institute of Birmingham which was begun in October, 1944, with a staff of two persons, and which now has a staff of 38 scientists and 15 administrative personnel, and capital funds in excess of $1,000,000.

United Lt. & Rys. Appoints Stafford Publicity Director

J. M. Stafford, Jr., acting advertising manager of Georgia Power Co., has been appointed director of advertising and publicity for United Light & Railways Service Co. with headquarters in Kansas City, Mo. In his new position Mr. Stafford will direct the advertising program of eight companies in Missouri, Kansas, Iowa and Illinois.

Mr. Stafford entered the employ of Georgia Power Co. in 1925 and has been in the advertising department since that date. From 1940 to 1942 he was chairman of the employee activities committee of the Southeastern Electric Exchange and has been a member of the advertising and sales committee. He is prominently known in the activities of the Public Utilities Advertising Association, serving as a director from 1943 to 1946. He was editor of the P.U.A.A. Bulletin in 1943. Under his direction, Georgia Power advertising and public relations activities have won numerous national and regional awards in the annual P.U.A.A. competitions. In 1940 he won the B. C. Forbes award, administered by E.E.I. for the "most meritorious paper dealing with the subject of public relations in the electric light and power industry."



J. M. STAFFORD, JR.

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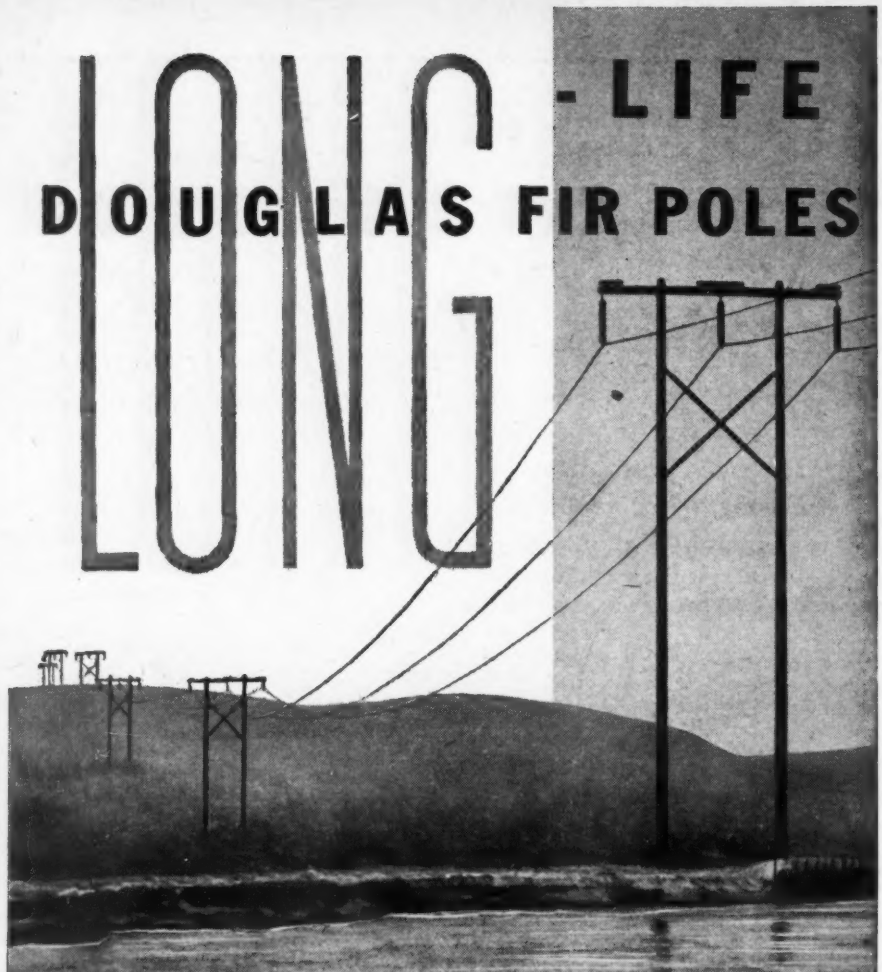
▶ JOHN R. PENTACOST has been made manager of the Choctawhatchee Electric Cooperative with offices at De-

LONG-LIFE
DOUGLAS FIR POLES



Our specialty is long-length Douglas Fir poles, pressure treated for Long-Life service. Prompt shipments of reasonable quantities can now be made in most lengths from 60 foot to 125 foot. Direct rail shipments out of our treating plant stocks can be made to any point in the United States. Write or wire us your inquiries.

Pressure treated Douglas Fir poles have been for years the standard in pole line construction on the West Coast. Our Long-Life Douglas Fir poles meet ASA Specifications and are pressure treated with coal-tar creosote or creosote-pentachlorphenol solution by the empty cell process, 8-lb. retention, in accordance with AWPA Specifications.

Long-Life Douglas Fir poles, pressure treated from high quality Coast-type timber, will cut your maintenance costs and yield longer and more satisfactory service.

Also Produced by J. H. Baxter & Co. of Oregon—*an associated company*
Plant and Yard—Eugene, Oregon

J. H. Baxter & Co.

333 MONTGOMERY STREET · SAN FRANCISCO 4, CALIFORNIA
LOS ANGELES · LONG BEACH · ALAMEDA · CALIFORNIA, U. S. A.

Funiak Springs, Fla. Mr. Pentacost was formerly manager of REA properties at Jay, Fla.

•

Aluminum Company Elects Magee Vice-President

Frank L. Magee, general production manager for Aluminum Co. of America, has been made a vice-president of the

F. L. Magee

company. He will continue in his present duties, reporting to I. W. Wilson, vice-president in charge of production.

Mr. Magee has been connected with Alcoa for 30 years. His experience with the company has covered both sales and operation. In 1943 Mr. Magee became general production manager and assistant to vice-president I. W. Wilson.

•

▶ Louis Kahn, assistant chief engineer of Aerovox Corp., New Bedford, Mass., has been awarded a certification of appreciation for volunteering generously of his time and experience to the war committee work of the American Standards Association.

▶ W. C. Yates, assistant manager of the General Electric Co.'s industrial divisions, has retired, following 48 years' service with the organization. Mr. Yates joined G.E. in 1898 on the test course and in 1913 became commercial engineer of what is now the control division, later being made manager of sales. In 1937 he assumed the managership of the control and renewal parts division of the industrial divisions and in 1941 he was appointed an assistant manager of the industrial divisions. In recognition of his 30 years' affiliation with the control section activities of the National Electrical Manufacturers Association, Mr. Yates was honored at a dinner held recently in

CABLE INSTALLATION CREWS PREFER COPE EQUIPMENT

STRONG COMPACT ATTRACTIVE **WARNING EQUIPMENT**

AVAILABLE IMMEDIATELY

Cope SAFETY GUARD RAIL

Entirely constructed of steel pipe welded for extra strength. The wing bow brace, a "Cope" exclusive, locks the frame in the open position and permits the use of chains on the open side instead of the usual arm hook arrangement. The chains may also be used for locking the folded guard rail to standing equipment or poles while not in use.

Quotations on this or your own design on request.

Cope SAFETY WARNING SIGNS

"Cope" Warning Signs are extremely rugged with welded steel frame and steel panel. The legs lock in position and fold as compactly as a card table, requiring a minimum of space. When placed squarely in position they will not blow over or collapse.

The sign illustrated stands 30" high and 18¾" wide with an 18" square panel painted with 5" letters. Quotations on this or specially painted panels on request.

Write for complete catalog and prices.

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TOOLS AND EQUIPMENT FOR THE INSTALLATION AND MAINTENANCE OF CABLE FOR OVER FIFTY YEARS

Put it out with GRINNELL MULSIFYRE

When such a seemingly unimportant item as a bushing failed — a transformer in an important sub-station was enveloped in blazing oil. Hose streams were inadequate to cope with the situation. Damage amounted to thousands of dollars before the fire was controlled.

Time and again it has been proved that the unusual nature of oil fires in transformers and other electrical equipment calls for more than old-fashioned fire-fighting methods. It requires the positive protection of a Grinnell Mulsifyre System – engineered to kill such fires fast!

Grinnell Mulsifyre Systems have gained wide acceptance on a proved effective principle – in which blazing oil is emulsified with a driving spray of water. The oil is turned into a liquid which is incapable of burning – the fire is extinguished in a few seconds – reignition is prevented.

There is absolutely no conductivity along the discharge of a Mulsifyre projector when spray strikes conductors carrying high voltages. Mulsifyre Systems are permanently installed – are constantly on guard when operated automatically – or may be operated manually.

Recommended by Underwriters' Laboratories for use in extinguishing fires in flammable oils immiscible in water, wherever such oil is a fire hazard – in transformers and other oil-filled electrical equipment.

Don't wait for fire to strike. Provide this 24-hour-a-day protection for your equipment from now on. Grinnell engineers will help you plan protection for your specific needs.

GRINNELL COMPANY
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GRINNELL *Mulsifyre*
AUTOMATIC FIRE PROTECTION

TIREX Cables - *Lifelines* to Production

Trailing behind, but of foremost importance to the operation of shovels, derricks, and cranes is the power cable upon which these machines must rely in order to achieve high postwar production.

Foremost too, among power cables, is TIREX, known to miners for many years for its dependable performance even under the most severe conditions that natural and mechanical hazards present.

Engineered to meet the most rigid specifications as to design and construction, TIREX can well be the answer to your cable requirements. The copper conductors are stranded to provide flexibility thereby eliminating delays due to snarling or twisting, and a tough jacket of Selenium Rubber Armor over the insulation furnishes protection against water and abrasives.

For insurance against costly delays in production remember Simplex-TIREX power cables the next time you equip your mining machines.

Simplex - WIRES & CABLES

SIMPLEX WIRE & CABLE CO. 79 SIDNEY ST. CAMBRIDGE 39, MASS.

Schenectady by officials of control equipment manufacturing companies from all over the United States. He has been a member of NEMA since its inception.

•

H. R. Wengen Joins Staff of Fargo Manufacturing

Henry R. Wengen, formerly manager of the Lower Hudson division of the Central Hudson Gas & Electric Corp.,

H. R. WENGEN

has been appointed sales engineer of the Fargo Manufacturing Co., Inc., Poughkeepsie, N. Y.

A native of Wakefield, Mass., Mr. Wengen received his technical education at the Massachusetts Institute of Technology and after completing the General Electric test course he joined the Central Hudson utility in 1929 as cadet engineer. He had served as assistant to the Poughkeepsie district manager and was occupying the position of manager of the Lower Hudson division when he received the Fargo Manufacturing appointment.

OBITUARY

► E. RALPH BEDENBAUGH, district manager of the Georgia Power Co. in Hartwell, died on October 31 of a heart attack. Mr. Bedenbaugh had been associated with the Hartwell district of the utility since 1937 and previously had been with the company in Athens.

► ARTHUR W. WOLF, chief electrical engineer on the staff of Guy B. Panero, consulting engineers, New York, died on December 3 of a heart attack at his home in St. Albans, Queens, N. Y. He was 57 years old. Associated for 12 years with the firm of Clyde R. Place, Mr. Wolf played an important part in the electrical engineering design of

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ALL the strength and durability inherent in steel are combined—with definite economies—in *Crapo* Galvanized Steel Strand. Heavy, ductile, tightly-bonded zinc coatings, applied by the famous *Crapo* Galvanizing Process, provide lasting protection against corrosion.

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For more than 45 years the famous STEPHENS Climbers have been exclusively manufactured by

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and in that time one objective has been constantly kept in mind—to maintain the same high quality standards established by Wilmot Stephens when he first forged climbers on a blacksmith's anvil almost a half century ago.

Extreme care is taken to provide safe, comfortable equipment, and every article is inspected to comply with the exacting requirements established by safety engineers.

Buckingham "Cushion Deluxe" Floating Tool Belt No. 58 is made from the best latigo and chrome leathers. It has the "rolled edge" feature that gives a cushion effect with the greatest comfort to the wearer. Rigidly tested for strength and safety.

Here's Why Buckingham Climbers are Safer — More Comfortable!

- Shank a perfect fit, shaped for comfort.
- Wide standing surface slightly rounded to fit foot.
- Round loop will not cut straps.
- Gaff is hammer-forged from special tool steel, set straight with body of climber and close to foot-piece, giving least strain to climber, and maximum comfort to lineman.
- Each climber tested for toughness and strength of gaff rivet.
- Each climber Parkerized (rust proofed) and lacquered.

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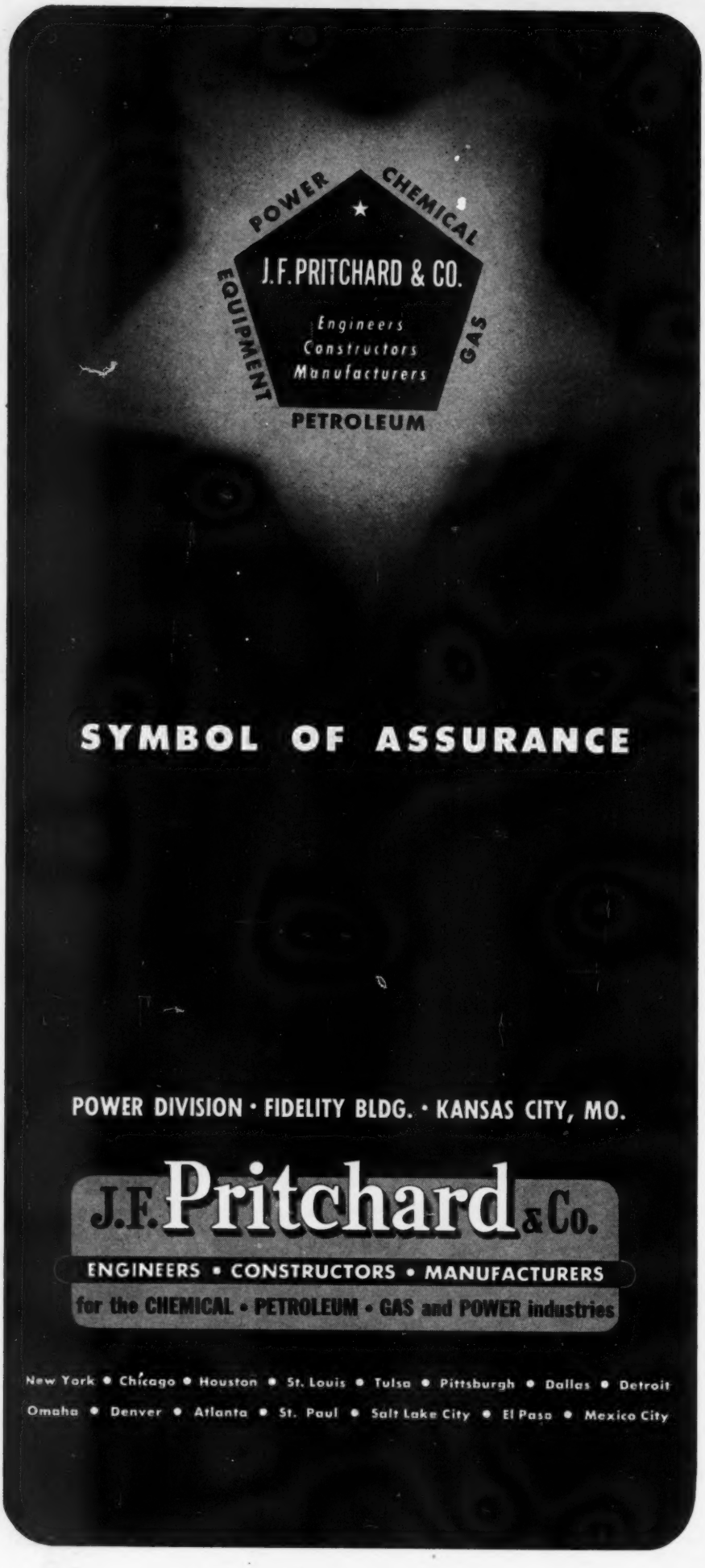
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Rockefeller Center, the Museum of Modern Art, the Graybar Building, and other important structures in this and other cities.

▶ CHESTER A. NORTON, sales manager, Pierce Laboratory, Inc., New York, died on December 10 at his home in Huntington, Conn., after a prolonged illness. He was 55 years old. Mr. Norton was secretary and a member of the board of the Electrical and Gas Association of New York, Inc. Born in Carthage, Mo., Mr. Norton became identified with the electrical industry as a young man. He joined the Westinghouse Lamp Co. for which he worked for 28 years as district manager in Seattle and in Boston and as national sales manager in New York. Mr. Norton had been associated with Pierce Laboratory for the past eight years.

▶ CHARLES M. WALTER, assistant to the president of the Pennsylvania Power & Light Co., Allentown, died suddenly on December 8 in that city at the age of 78. Mr. Walter had been associated with Pennsylvania Power & Light, the Lehigh Valley Transit Co., and their predecessors for 52 years. A leader in the development of the company, Mr. Walter was secretary and treasurer from 1920 until 1942, when he was appointed to the position he held at the time of his death. He had also been secretary-treasurer of the Lehigh Vally Transit Co. since 1932. Before the formation of the power and light company he was secretary and treasurer of all but one of the seven companies that were later included in the new organization.

▶ JASPER K. JOHNSTON, retired executive of the General Electric Co., died suddenly at his home in Milford, Conn., on November 28 at the age of 75. A native of Newtown, Iowa, Mr. Johnston joined the Bryan-Marsh division of the National Lamp Works as New York salesman in 1904 and was put in charge of the New York branch in 1920, becoming manager in 1921. Four years later Mr. Johnston was made manager of the Atlantic Division, with headquarters in New York, and in 1928 manager of the consolidated Atlantic-Federal sales division of the National Lamp Works of the General Electric Co. He retired in 1938.

▶ JAMES C. TRYON, superintendent of distribution of the Middletown division of the Connecticut Power Co., died on October 15 after a short illness. Mr. Tryon had been connected with the company for almost 40 years, having joined the predecessor company, the Middletown Electric Light Co., before the companies were merged into the existing organization.

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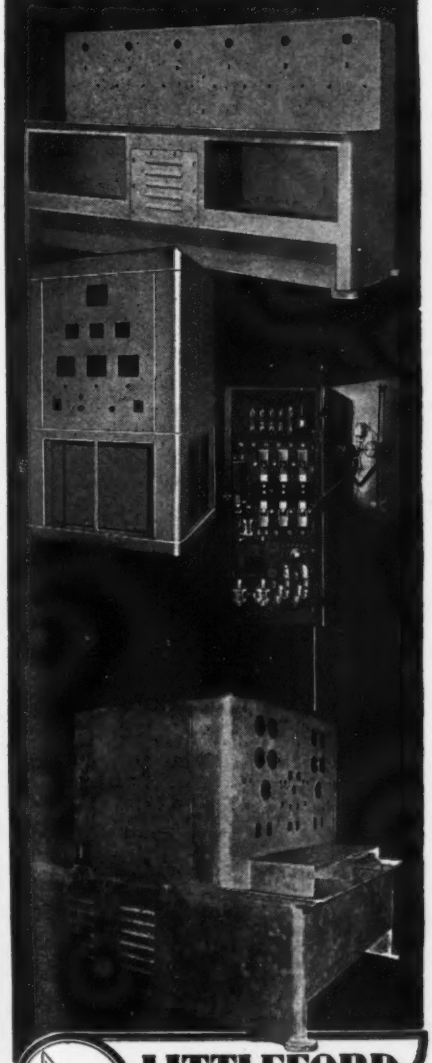
Exactness in Construction is the Reason why Littleford is one of the foremost fabricators of Mounting Structures. The skill in fabricating Switch Boards, Panel Boards, Cabinet Control Boards, Steel Cubicles, Steel Enclosures, Test Panels, etc., comes from experience plus modern facilities. Littleford is equipped to form, shape and weld complete products or assemblies to fit your requirements. When contemplating an installation, send blueprints to Littleford—see the savings incurred when Fabricated the Know How Way.



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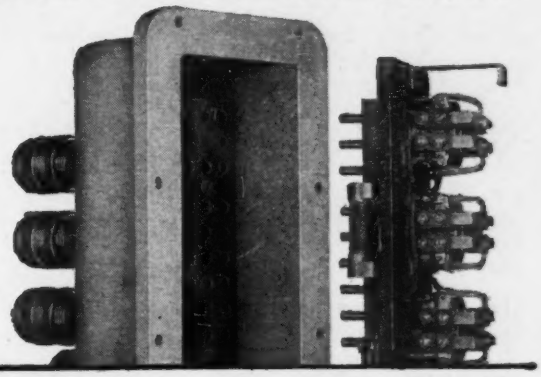

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Saves valuable space, reduces engineering and installation costs to a minimum.

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51

MANUFACTURERS & MARKETS

National Sales, Marketing Conference Called to Prepare for Buyers' Market

A national conference of marketing executives has been called by Alvin E. Dodd, president, American Management Association, for January 9 and 10, in New York, to appraise marketing conditions in the new year and exchange information on sales and distribution problems arising from the current shift to a buyers' market and the economic and social adjustments occasioned by unsettled conditions in many industries.

In announcing the meeting Mr. Dodd said, "Hundreds of companies in all kinds of business feel that although they have been planning for years for the return of a buyers' market, there is uncertainty and confusion now because of unsettled conditions—perhaps even more than before the war ended. The conference will give everyone an opportunity to sift trends and exchange information necessary to meet present unusual conditions and prepare for the most effective marketing and distribution efforts in the coming months."

Invitations to the two-day open meeting to be held at the Hotel Commodore are being sent to sales executives and managers in all types of business. Approximately 1,000 are expected to attend.

Topics on Agenda

Agenda for the conference, compiled by a committee of leading marketing executives in representative businesses, provides for discussions of economic factors affecting marketing, price and cost considerations in heavy and consumer industries, measuring markets and potentials, distributor organization, sales and distribution cost reduction, consumer attitudes, advertising and promotion, salesmen's compensation and related subjects. Authorities on these subjects will lead discussions and those in attendance will participate in group and panel sessions.

Conference arrangements are being supervised by A. A. Stambaugh, vice-president, Standard Oil Co. of Ohio, Cleveland, who is also A.M.A. vice-president in charge of the marketing division. He is being assisted by a planning council which consists of executives from seven of America's larger companies.

•

Predict Rubber Products Shortages for Some Time

Although the rubber industry produced a record peace-time volume of goods in 1946 and is expected to repeat this performance, or better it, in 1947, the pent-up demand for rubber products is such that shortages will continue for many months, according to a statement by Herbert E. Smith, president, United States Rubber Co.

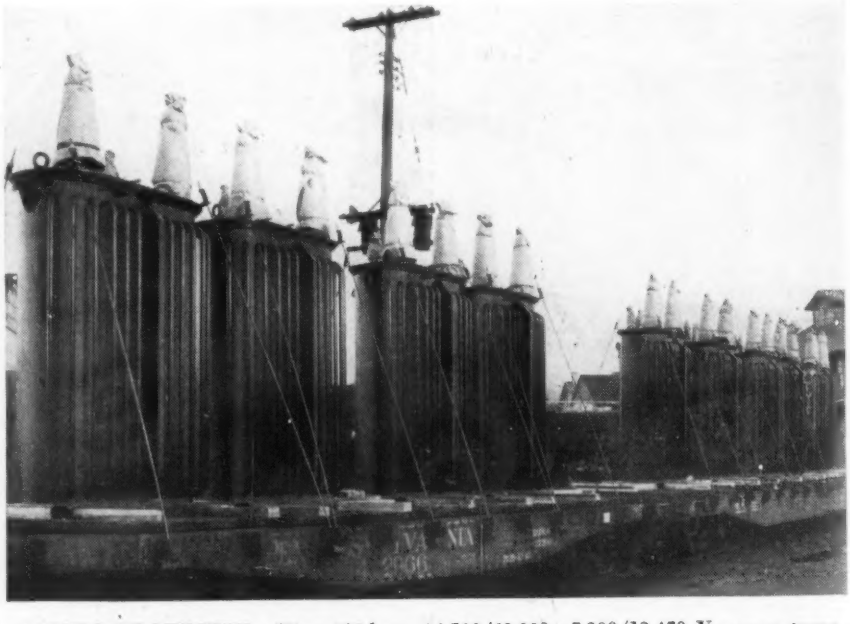
Indications are that final sales figures will show that the industry in 1946 produced goods valued at $2.3 billion, which was more than double the volume of 1940, the previous record year of wholly peace-time output, Mr. Smith said. It is estimated that sales in 1947 will be $2.3 to $2.5 billion.

In 1947, for the first time in four years, the industry will use more natural rubber than synthetic. Consumption of natural is expected to be about 51 percent of the total. This compares with 22 percent in 1946.

Total consumption of rubber by the United States in 1947 is estimated at 980,000 tons, of which 502,000 tons will be natural and 478,000 tons various kinds of synthetic rubber. Consumption in this country in 1946 was slightly over one million tons, Mr. Smith stated.

Data and statements presented by producing nations to the international rubber study group "indicate clearly a world shortage of natural rubber in 1947," which will be most pronounced in the first half of the year, George M. Tisdale, vice-president of the company, said in commenting on the situation.

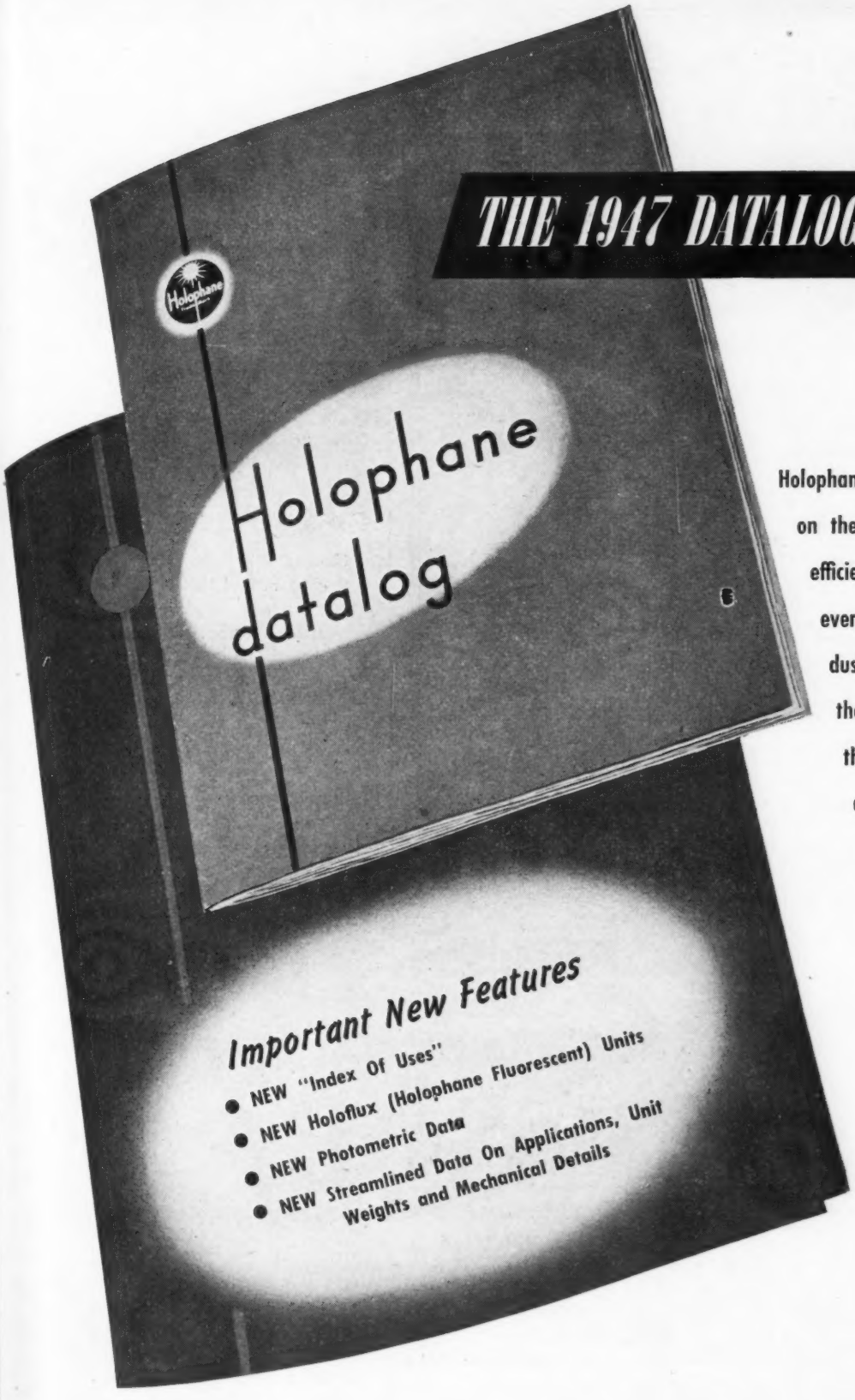
Mr. Tisdale, who recently returned from The Hague, where he attended meetings of the study group as adviser to the United States State Department, asserted that this situation required "a continuation of public procurement and specification controls" on natural rubber by the various govern-



SPRING PROTECTED—Nine 333-kva., 34,500/69,000—7,200/12,470 Y power transformers leaving Standard Transformer Co., Warren, Ohio, for Minnkota Power Co-op, Grand Forks, N. D., are protected against shocks in shipment by springs. Stresses are absorbed by the springs on the tie rod rather than by the case

THE 1947 DATALOG* IS READY

*Registered Trade Mark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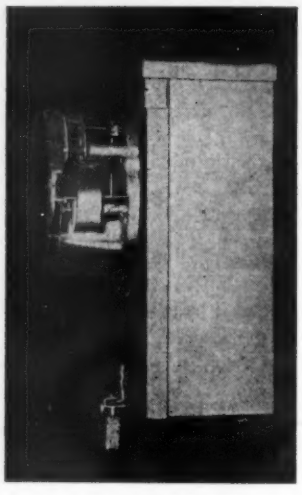

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ment agencies. He expressed the opinion that these controls should be subject to periodic joint review by government and industry.

•

Bakelite Strike Settled

Settlement of the three-month-old strike at the Bound Brook, N. J., plant of the Bakelite Corp. has been announced by the U. S. Conciliation Service. The striking employees, members of the Chemicals and Crafts Union, an independent organization, have voted to accept the contract terms recommended by the U. S. Conciliation Service. The terms include a general increase of 13 cents an hour.

•

Form New Distributing Unit

General Electric Appliances, Inc., a new corporation, has been organized to carry on the business formerly conducted by the nine G. E. appliance distributing branches. The corporation's headquarters are at Bridgeport, Conn. Branches are located in Boston, New York, north Jersey (Bloomfield), Philadelphia, Pittsburgh, Florida (Jacksonville), Cincinnati, St. Louis and Los Angeles.

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TRANSMISSION TOWERS

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New Crankless Types, 500 Volts, 0-200 Megohms with additional ohm scales. Check Motor Insulation. Prevent Breakdowns. Check wires and cables.

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For quick load checks on AC and DC. Not just AC. Greatest Time Saver.

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HERMAN H. STICHT CO., INC.
27 PARK PLACE NEW YORK 7, N. Y.

RUGGED TESTING—This combination oven-refrigerator which varies the temperature from 50 deg. below zero to 200 deg. above has been constructed at Westinghouse research laboratories to test the strength of Micarta. Frank Cassel, research engineer, is obtaining physical dimensions before beginning the fatigue test. The test specimen, along with a similar one on its left, will be vibrated 900 times per minute while the amount of load applied and the changes in flexibility of the plastic are measured by the wire resistance strain gage at the stationary end of the vibrator. The unit is cooled by dry ice and heated by electric coils

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LEAD AND ALUMINUM PAINT
Spot or Full Coat
for
Galvanized Structures.
It sticks, it blends.
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Recent Rate Changes

UNION ELECTRIC CO., St. Louis, has worked out a tentative contract with city officials, providing for rates covering street lighting and public buildings, that will be about 9.5 percent below the schedules in the present contract, which expired on August 31, 1946, but which has been extended on a temporary basis. The new contract will become effective on January 1, 1947. The proposed new schedule is as follows: 1½ cents per kilowatt-hour for the first 1,500,000 kw.-hr. per month; 1 cent per kilowatt-hour for the next 750,000 kw.-hr. monthly; 8/10 of a cent per kilowatt-hour for the next 750,000 kw.-hr., and 65/100 of a cent per kilowatt-hour for all electricity in excess of 3,000,000 kw.-hr. monthly. The old contract called for 1½ cents per kilowatt-hour for the first 2,000,000 kw.-hr. and 9/10 of a cent per kilowatt-hour for all in excess of that amount.

PERKASIE (PA.) borough council has tentatively adopted a new electric rate schedule which will add a minimum of $10,000 to the annual receipts of the municipal plant. Under the proposed schedule domestic consumers will pay approximately 10 percent more for energy; consumers in the commercial group will be increased approximately 8½ percent and industrial rate increases average 10 percent. The schedule approved carries the fuel adjustment clause, which permits a fluctuating charge to conform with the cost of fuel. The only consumers who will not pay more for energy under the schedule are the 96 householders in Perkasie who operate electric ranges. This group will receive a slight reduction, averaging approximately 50 cents a month.

CLARK RURAL ELECTRIC COOPERATIVE CORPORATION, Winchester, Ky., has been authorized to reduce its rates. Chairman Charles E. Whittle of the state Public Service Commission stated that the reduction would average about $8 annually to each of the co-op's rural customers.

BENTON COUNTY P.U.D. at Prosser, Wash., has announced that it will reduce rates from 10 to 22 percent as soon as construction of transmission lines and substations to serve the P.U.D. can be completed by the Bonneville Power Administration. The 16 rate schedules now in effect will be simplified to four, according to J. B. Whitehead, P.U.D. manager. The P.U.D. recently acquired by condemnation all Pacific Power & Light Co. distribution lines in the county for $1,265,000. The new rates will enable the P.U.D. to apply to debt retirement about 25 cents out of every dollar paid by Benton County consumers for electric power.

GRANT COUNTY P.U.D. No. 2 at Ephrata, Wash., has put into effect new rates from 10 to 20 percent below previous rates, Manager Glen Smothers has announced. The new rates are estimated to effect a saving to customers of $25,000 a year. They were made possible by a new arrangement to receive power from the Bonneville Power Administration, Mr. Smothers said.

SOUTH RIVER ELECTRIC MEMBERSHIP CORPORATION, Stedman, N. C., has reduced its farm and domestic electric rates, effective with the January billing. The cost of the first 100 kw.-hr. has been reduced from $5 to $4.25; the next 100 kw.-hr. from $2.50 to $2, and each 100 kw.-hr. over 200 from $1.75 to $1.50.

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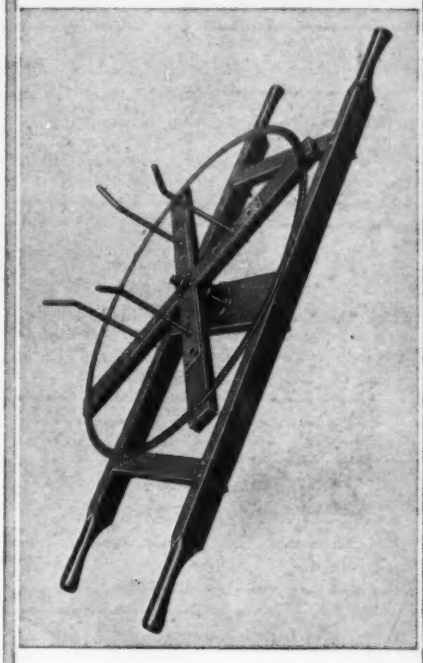
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